VIKTORIIA SEMENOVA

TECHNOLOGY ADOPTION THEORIES IN EXAMINING THE UPTAKE OF BLOCKCHAIN TECHNOLOGY IN THE FRAMEWORK OF FUNCTIONALIST AND INTERPRETIVE PARADIGMS

TECHNOLÓGIAADAPTÁCIÓS ELMÉLETEK A BLOKKLÁNC-TECHNOLÓGIA ELTERJEDÉSÉNEK VIZSGÁLATAKOR A FUNKCIONALISTA ÉS INTERPRETATÍV PARADIGMÁK KERETÉBEN

The purpose of this paper is to examine the adoption process of emerging technology on the example of blockchain. The theoretical interpretation of blockchain acceptance and its implications are discussed from the positions of technology adoption theories (diffusion of innovation theory, the technology acceptance model, the unified theory of acceptance and use of technology, the technology – organisation – environment framework) as well as sensemaking theory. These theoretical models help understand the perception among end-users (e.g. supply chain practitioners) and facilitate technology diffusion among enterprises. Due to the novelty of the research field, the analysis revealed that current studies were conducted within the functionalist paradigm; however, studies on blockchain implementation can be equally done in the interpretive paradigm. The results indicate a shortage of empirical research investigations and the need for greater theory elaboration to accelerate the adoption process within organisations.

Keywords: **blockchain technology, functionalism, interpretivism, sensemaking**

A cikk célja a feltörekvő technológiák adoptációs folyamatának vizsgálata a blokklánc példáján keresztül. A blokklánctechnológia elfogadásának kereteit és következményeit a technológiaadaptáció-elméletek, valamint a jelentésadás (sense-making) elmélet alapján tárgyalja. Az előbbiek közül a cikk az innovációterjedés-elmélet, a technológiaelfogadási modell, a technológiaelfogadás és -használat egyesített elmélete, illetve a technológia-szervezet-környezet keretrendszer következtetéseire épít. Ezek az elméleti modellek segítenek megérteni a végfelhasználók (például az ellátási lánc szakemberek) felfogását, és megkönnyítik a technológiai megoldások vállalkozások közötti terjedését. Az elemzés feltárta, hogy a témában végzett eddigi kutatások a funkcionalista paradigmán belül történtek; azonban a blokklánc bevezetésével kapcsolatos vizsgálatok ugyanúgy elvégezhetők az interpretatív paradigmában is. A cikk eredményei az empirikus kutatások hiányára mutatnak rá, illetve felhívják a figyelmet a szervezeteken belüli adoptációs folyamatok felgyorsítását szolgáló elméletalkotó munkák szükségességére.

Kulcsszavak: **blokklánc-technológia, funkcionalizmus, értelmezés, érzékalkotás**

Author/Szerző:
Viktoriia Semenova, PhD student, Corvinus University of Budapest, (viktoriia.semenova@stud.uni-corvinus.hu)

Advances in new technologies have expanded the capacity of firms to disperse their activities geographically. The digital revolution and development of global supply chains have made possible the emergence of novel organisational forms and the upgrade of strategies and practices of business organisations (Baum & Haveman, 2020). These trends require powerful analytical tools to address the challenges

posed by increasingly complex and rapidly changing organisations.

Blockchain technology (BT), along with its emergence, adoption, and exploitation, has generated many kinds of research in different fields ranging from purely technical to business topics. In general, Demeter and Losonci (2020) indicated the increasing interest of academia and professionals towards the adoption of new and innovative technologies as well as digitally enabled new business models. The adoption behaviour in relation to different novel technologies has been widely studied, among them the "Internet of things" (Gao & Bai, 2014), big data (Sun et al., 2018), cloud computing (Alkhater et al., 2018), and bitcoin (Folkinshteyn & Lennon, 2016).

The present study explores the main technology adoption theories and models which explain the benefits of blockchain for organisations and their processes and predict the further adoption process of the technology. The broader use of blockchain for business purposes has already been started by such leading companies as IBM, SAP, Microsoft, and Boeing (Saberi et al., 2018). Bearing the characteristics of a decentralised trustless database, blockchain allows global-scale transactions and process disintermediation and decentralisation amongst various parties (Crosby et al., 2016). The technology can significantly reduce costs and improve operational efficiencies (Kshetri, 2018) as well as weaken the role of middlemen in the network by supporting peer-to-peer transactions (Saberi et al., 2018). Economically, diffusion of blockchain technology can benefit a firm and its supply chain from various business dimensions affecting economic performance (Saberi et al., 2018).

The significance of theories of economics, strategic management, and organisation for blockchain technology management is seen in the extant literature. In order to explain the phenomenon of blockchain and its strategic competitive advantage, such mainstream theories and views as transaction cost economics (Ahluwalia et al., 2020; Schmidt & Wagner, 2019; Treiblmaier, 2018); agency theory (Pan et al., 2020; Treiblmaier, 2018); network theory (Queiroz & Wamba, 2019; Somin et al., 2020; Treiblmaier, 2018); contract theory; the resource-based view (Treiblmaier, 2018); the diffusion of innovation (DOI) theory (Kshetri, 2018); the technology acceptance model (TAM) (Kamble et al., 2019); the unified theory of acceptance and use of technology (UTAUT) (Queiroz & Wamba, 2019; Wong et al., 2020a, 2020b); and the technological, organisational, and environmental framework (TOE) (Clohessy et al., 2019; Wong et al., 2020a) are extensively used by the scholars. Diffusion theory suggests that technology can have various levels of diffusion across diverse industries (Rogers, 1995). The TAM and UTAUT, derived from the original TAM constructs, explain the acceptance of technology based on behavioural intention, whereas the TOE suggests a more comprehensive view on the adoption of technology.

Regarding the multiplicity of theories and views, it is complicated to comprehend their connections. Moreover, the theoretical development is not fully elaborated because this technology is still in its early stage (Frizzo-Barker et al., 2020) and the number of enterprises that are developing and implementing it is constantly increasing each year (Puel et al., 2020). According to Baum and Haveman (2020), organisation theories can significantly assist in understanding new phenomena. So there is a need for more empirical research and greater theory elaboration for this interdisciplinary domain to better understand its potential and the adoption process among the network of enterprises.

Due to a considerable number of technology adoption theories related to the potential of blockchain and the radical changes blockchain can induce, the following research questions are formulated: What major technology adoption theories and models have been applied in relation to blockchain technology? How do they contribute to explaining the adoption process of blockchain? The answer to these questions will be given by providing a review of the technology adoption models being recently applied in relation to blockchain technology implementation in supply chains. Papers conducted in the framework of the positivist/functionalist paradigm are analysed and compared to articles conducted within the interpretive paradigm that can be considered an alternative to them. The purpose of the study is to explore the adoption process of blockchain technology and the main factors influencing the adoption behaviour of supply chain practitioners.

The paper is organised in the following way. The second part outlines the research methodology. Section 3 introduces blockchain technology and provides a summary of the existing literature reviews on blockchain. Section 4 is devoted to multiparadigm inquiry and compares functionalist and interpretive paradigms. Section 5 consists of an analysis of the studies incorporating technology adoption theories and sensemaking theory and considers them under two paradigms. Conclusions, limitations, and further research directions are provided in the last section.

Research methodology

As the technology of blockchain is applicable across various industries and for different applications, there are a number of adoption theories that are used to investigate the implications and acceptance of this new and complex technology. The method of systematic literature review is applied in this study as it generates useful information and identifies practical implementation and conceptual frameworks from available resources (Hart, 1998); additionally, it can result in more objective, transparent, and replicable reviews (Briner & Walshe, 2014). So this paper focuses on analysing the existing literature on various technology adoption theories pertinent to blockchain technology's user perception and application in the context of supply chains. The fact that most of these studies were conducted using a positivist paradigm and are compared to the one interpretive study helps to more thoroughly explain the emerging phenomenon.

The relevant research studies were searched in June 2020 in the two world-leading and competing citation

databases: Web of Science (WoS) and Scopus (Zhu & Liu, 2020). The search terms "*blockchain*" AND "*adoption theory*" AND "*supply chain*" were used within these databases to retrieve available publications. This specific search yielded similar papers in both databases; namely, around 20 articles were identified. Each of the papers retrieved by the search was reviewed for quality and relevance. As advised by Kitchenham and Brereton (2013), the search and data collection process followed a three-stage process – search, select, and validate the literature. Both conceptual and empirical studies were analysed. Some articles were excluded for the following reasons: application of economic or informatic theories which did not correspond to the subject of the paper; articles which explored other fields (e.g., cryptocurrencies, token economics) rather than the supply chain area; and articles without full availability, duplicate papers, or articles published in low-ranked journals and conference proceedings. In the end, 8 high-quality publications were collected, including 7 papers using at least one of the technology adoption theories and prepared within the functionalist paradigm and one article with the application of sensemaking theory and conducted within the interpretive paradigm. The data on these articles were grouped according to the theories applied, the main constructs were analysed, and the results were compiled, as shown in Table 1. The reviewed articles were primarily published in such high-impact Q1 journals as the *International Journal of Information Management, International Journal of Production Research, International Journal of Production Economics,* and the *Journal of Business Logistics.*

Acquaintance with blockchain technology and its literature reviews

Blockchain was first introduced in the bitcoin protocol by using several existing technologies which allow the creation of a peer-to-peer version of electronic cash. BT is a protocol of open, transparent, and secure distributed ledger technology that eliminates the need for a trusted third party (Nakamoto, 2008). The interest in blockchain is due to its attributes that ensure security, anonymity, and data integrity without any third-party organisation controlling the transactions (Yli-Huumo et al., 2016). While some authors (Kane, 2017; Pilkington, 2016) have labelled blockchain as a radical disruptive innovation that has the characteristics of a general-purpose technology (GPT), Iansiti and Lakhani (2017) proposed a more relevant definition of BT, naming it a foundational technology that can create new foundations for social and economic systems. According to Iansiti and Lakhani (2017), blockchain has recently emerged as a critical technological advance. Clohessy et al. (2019) professed a belief in the dual mission of blockchain by stating that it will "put an end to traditional ways of doing things and usher in a new era for business and the world" (pp. 69 – 70). As the introduction of bitcoin in 2008 led to a paradigm shift in how transactions are processed around the

world (Nakamoto, 2008), bitcoin's popularity generated broad interest in its underpinning technology. It is said that blockchain technologies will disrupt a multitude of industries and transform existing business processes. For example, blockchain has a high potential to disrupt inefficient models and improve supply chain management (SCM) operations models (Queiroz & Wamba, 2019).

After the publication of Satoshi Nakamoto (2008) on the blockchain mechanism and main application, the technology of blockchain has gained wide public recognition and generated great research interest. The literature on blockchain predominantly has covered the technological aspects since Nakamoto's publication. In this regard, Yli-Huumo et al. (2016) located and mapped all papers on blockchain with its technical perspectives containing security, performance, data integrity, privacy, and scalability. The results indicate that most of the papers mentioned the seven technical challenges and limitations outlined by Swan (2015): throughput; latency; size and bandwidth; security; wasted resources; usability; and versioning, hard forks, and multiple chains (pp. 81 – 83). These challenges and privacy were used to classify and map the existing studies on blockchain, among which more than 80% of the works focused on the bitcoin system, and less than 20% dealt with other blockchain applications like smart contracts, voting, and property licensing (Yli-Huumo et al., 2016). Most of the research studies attempted to address the issues with blockchain's limitations from privacy and security perspectives.

Since 2014, business scholars have started to research blockchain's different aspects and business applications. Several systematic literature reviews (Casino et al., 2019; Frizzo-Barker et al., 2020; Ozdagoglu et al., 2020; Wamba & Queiroz, 2020) have already been performed. Casino et al. (2019) conducted a systematic literature review of blockchain-based applications across multiple fields to discover how specific characteristics of this disruptive technology can revolutionise business-as-usual practices. The authors presented a classification of the blockchain-enabled applications across diverse sectors based on a structured, systematic review and thematic content analysis of the literature. Frizzo-Barker et al. (2020) carried out a PRISMA guided systematic review of the blockchain research in the business literature from 2014 to 2018. According to the results of their research, blockchain remains an early-stage area of research in terms of theoretical foundation, methodology, and empirical work. Instead of technical aspects, Frizzo-Barker et al. (2020) explored the business and organisational implications of this nascent technology. Ozdagoglu et al. (2020) conducted a study to discover the current state of blockchain research by applying a scientometrics methodology, which is used in analysing data extracted from online scientific databases, and the authors provided a holistic view of the blockchain-related literature.

Hughes et al. (2019) noted that blockchain applications have often been discussed in the context of logistics and SCM. In this context, it is relevant to refer to the study of Wamba and Queiroz (2020), in which the researchers

aimed at understanding blockchain applications in operations and supply chain management (OSCM) and the way firms create and capture value with blockchain technologies. Wamba and Queiroz's bibliometric analysis demonstrated that blockchain applications in regard to OSCM still remain in the infant stage, and there is a need to explore the role of blockchain in terms of operations traceability, e-commerce, public services, agriculture, and other areas.

Multiparadigm inquiry: focus on the functionalist and interpretive paradigms

In order to stimulate further research on blockchain and blockchain-based enterprises, a brief multiparadigm review of the related literature is presented in this section. Multiparadigm reviews, along with multiparadigm research and metaparadigm theory building, are three approaches to multiparadigm inquiry which were described by Lewis and Grimes (1999). In multiparadigm reviews, two techniques assist reviewers: paradigm bracketing and bridging (Lewis & Grimes, 1999, p. 673). The first technique implies differentiating between diverse sets of assumptions and adds a critique of alternative views. Burrell and Morgan's typology of sociological paradigms serves as the most relevant framework for paradigm bracketing. The second technique reviews transition zones, attempting to integrate paradigms' theoretical perspectives and combine their similarities. Such transition zones allow researchers to grasp a variety of research strategies within different paradigms and thereby enrich the research outcomes. As noted by Lewis and Kelemen (2002), multiparadigm reviews help researchers to understand the assumptions of various paradigms and be aware of the differences in the obtained results.

Burrell and Morgan (1979) classified existing theories within their typology to show how opposing viewpoints are maintained by different assumptions. Within the Burrell and Morgan matrix, the politically conservative functionalist and interpretive paradigms are contrasted with the conflict-oriented radical structuralist and radical humanist viewpoints. In contrast, the functionalist and radical structuralist paradigms share a more objectivist scientific view, while the interpretive and radical humanist paradigms adopt a more subjectivist position. Due to various characteristics, each of the four paradigms has its own approaches and analytical tool to conduct research.

The current study concentrates on comparing functionalist and interpretive perspectives because they are the dominant ones in organisation and management studies (Burrell & Morgan, 1979). For instance, they were applied in analysing the application of information technologies (IT) for knowledge management (Butler & Murphy, 2007), understanding the implementation of a new computer system in the workplace (Prasad & Prasad, 2000), and explaining the relationship between globalisation and IT (Ardalan, 2011). Functionalist studies tend to approach technology as a determinant of organisational structure (e.g. structural contingency

theory) (Donaldson, 2003), while interpretative works treat it as a social object (Barley, 1986) that can alter the relations of production and organisational structure. Doing research within these two paradigms, it is possible to compare the subjectivist stance on a given topic with the more objectivist one. Before proceeding further, the main peculiarities of these two paradigms are briefly described.

The functionalist paradigm often employs refinement of theory. According to Donaldson (2003), functionalist research aims to generate general theories or control phenomena (Chia, 2003). The theory building is primarily implemented in a deductive manner, that is, the first step includes the literature review and the consideration of prior theories. As suggested by Gioia and Pitre (1990), the aims of hypotheses are threefold: the revision/extension/rejection of original theory in a new way, the attempt to close a research gap in the current state of knowledge, or the testing of competing interpretations for structural relationships. The formulation of hypotheses is based on the selected variables; therefore, in accordance with the formulated hypotheses, specific instruments are used to collect the necessary data and the required procedures are designed. The researchers stick to the consistency of variables and hypotheses throughout the whole theory-elaboration processes (Gioia & Pitre, 1990, p. 590).

By contrast, the theory-building process in the framework of the interpretive paradigm is mainly grounded in the inductive reasoning that may reveal structuring processes due to which actors construct social meanings and roles. Based on Cunliffe (2011), exploring narratives is an important characteristic but building theories is not. Gioia and Pitre (1990) emphasised that the researcher should tend to be a part of the studied phenomenon. One of the tasks of the researcher is to gather data that are important to the informants and convey their unique representations. The analysis of data starts simultaneously with the data collection and usually uses coding procedures. Subsequently, analysis, theory generation, and further data collection are interrelated processes (Gioia & Pitre, 1990, p. 588).

Donaldson (2003) and Hatch and Yanow (2003) noted that the two paradigms possess differences in relation to the mode of analysis: interpretive analysis is associative whereas the functionalist paradigm operates in a causal mode. Furthermore, interpretivists consider the importance of culture and context for shaping phenomena, and they explain their findings in terms of emergent images and metaphors, while the functionalist or positivist paradigm adheres to the predefined and universal analytical framework, analysts operating under this paradigm tend to generalise things. As was mentioned, interpretive scholars, unlike positivists, use relatively low levels of deductive and higher levels of inductive reasoning.

As Donaldson (2003) stated, the organisation has to adapt to its environment by fitting its organisational structure into the contingencies, such as the size of organisation or technology. Studies conducted in the framework of the functionalist paradigm are analysed to understand how the organisation exploits or plans to

employ emerging technologies. Here the researchers are acting as functionalists by following a quantitative and positivist approach, and they prefer such scientific research methods as statistics, questionnaires, and structured interviews. In contrast, interpretive researchers construe social reality through a sensemaking process and rely on qualitative data, mainly interviews. That is why, as an alternative view to positivist research, the work of Wang et al. (2019) was chosen as work that is done within the interpretive paradigm with the application of sensemaking theory. According to interpretivism, individuals are those who create society through their interactions. In this context, this sensemaking approach allows us to more deeply understand the perception and knowledge of supply chain (SC) experts about technology (Wang et al., 2019) and predict their future actions and the actions of other practitioners regarding its application.

Analysis of works done under functionalist and interpretive paradigms

Technology adoption theories

First of all, a number of research studies have been conducted to assess the blockchain effect on organisational activities and examine the adoption process of blockchain technologies across various industries (Grover et al., 2019). As a matter of fact, the majority of such studies have been done in the framework of the functionalist paradigm and in relation to SCM and logistics. According to Kshetri (2018), blockchain technology has a relative advantage in SC activities in comparison to the financial industry. The technology can result in SC disintermediation, leading to reductions in transaction costs and time and to a decrease in business waste in the supply chain (Saberi et al., 2018). The most widely applied models are the diffusion of innovation theory (Kshetri, 2018), the technology acceptance model (Kamble et al., 2019; Queiroz & Wamba, 2019), the unified theory of acceptance and use of technology (Queiroz & Wamba, 2019; Wong et al., 2020b), the technology – organisation – environment framework (Clohessy et al., 2019; Wong et al., 2020a), and interorganisational system (IOS) adoption theory (Sternberg et al., 2020). They serve to identify the constructs and factors which impact the decision to adopt technological innovation, in this case, blockchain technology (see Table 1), and to understand the behavioural intentions of adopting BT.

Table 1.

Papers based on application of technology adoption theories & models in relation to blockchain deployment

Author(s) / Year	Journal	Theories applied	Type of study	Sample/data source	Results
Kshetri (2018)	*International Journal of Information Management* (Q1)	DOI theory	Conceptual	11 case studies of blockchain projects; archival	– A relative advantage of BT in supply chain compared to finance industry – Blockchain-based SC products are more appropriate for the tech, auto, and garments industries and the oil trading sector, and the food industry is the most affected by blockchain
Kamble et al. (2019)	*International Journal of Production Research* (Q1)	TAM, TPB, TRI	Empirical	Online survey, 181 SC practitioners from 102 companies in India; archival	The validity of the proposed model based on the integration of TAM, TPB, and TRI: – Perceived usefulness, attitude, and perceived behaviour control – the most critical constructs that explain behavioural intention for BT adoption in SC – Discomfort and insecurity are not perceived as the inhibiting factors in the BT adoption process by SC experts – Low level of blockchain awareness among the SCM respondents
Queiroz & Wamba (2019)	*International Journal of Information Management* (Q1)	Network theory; TAMs with special focus on UTAUT	Empirical	Questionnaire, 344 & 394 SC professionals from India and the US, respectively; archival.	An altered version of the classical UTAUT with the integration of 2 new "constructs" trust of SC stakeholders and blockchain transparency: – Performance expectancy influences behavioral intention – Behavioral intention influences behavioral expectation – Facilitating conditions were supported only in the US, while in developing countries (e.g., India) such conditions repulse the BT adoption – Trust between SC stakeholders does not affect BT adoption in both cases

Wong et al. (2020b)	*International Journal of Production Research* (Q1)	UTAUT + additional constructs of technology readiness, technology affinity, trust	Empirical	Questionnaire, 157 firms in Malaysia were asked regarding BT adoption in SCM; archival.	– Incapability of the UTAUT to predict the adoption of immature technologies, and the key role of environmental readiness in adopting BT – Low familiarity with the technology among respondents, uncertainty in blockchain use at their companies – Insignificance of trust
Clohessy et al. (2019)	In Treiblmaier & Beck	Innovation Theory; TOE considerations	Conceptual	Review of the BT literature (16 final research resources) conducted in 7 databases	– Important technological considerations: perceived benefits, complexity and compatibility – Organisational considerations: organisational readiness, top management support, and organisational size – Environmental considerations: the regulatory environment and market dynamics – Important role of top management support in adopting BT
Wong et al. (2020a)	*International Journal of Information Management* (Q1)	TOE framework	Empirical	Questionnaire, 194 SMEs in Malaysia regarding BT adoption for OSCM	– The top 4 significant considerations: competitive pressure, complexity, cost, and relative advantage – Insignificant considerations: market dynamics, regulatory support and upper management support
Sternberg et al. (2020)	*Journal of Business Logistics* (Q1)	IOS adoption theory	Empirical	Single case study on the ReLog's vine supply chain	– Introduction of a synthesised model for BT interorganisational adoption in SC – Identification of positive (perceived benefits, external pressure, and organisational readiness) and negative IOS factors of adoption (perceived obstacles, external resistance, and organisational immaturity) – Specific phenomena of BT adoption in SC: the trust – investment paradox and the traceability – efficiency, visibility – privacy, and performance – commitment tensions

Source: author's compilation

Diffusion of innovation theory

The diffusion of innovation theory was developed by Rogers, who defined 5 main interrelated attributes for predicting future innovations' rate of adoption: relative advantage, compatibility, complexity, trialability, and observability (Rogers, 1995, p. 211).

Kshetri (2018) developed a framework to consider the contribution of blockchain to achieving the main SCM objectives through such mechanisms as validation of individuals' and assets' identities and incorporation of the IoT, which may "make tracking possible and more accurate" (p. 87). In this context, 11 case studies of blockchain projects at various stages of development were discussed: Maersk; Provenance; Alibaba; the largest defence contracting firm Lockheed Martin; San Francisco-based blockchain start-up Chronicled and life sciences supply chain consultancy LinkLab; the Swiss start-up Modum in cooperation with the University of Zurich; the London-based start-up Everledger; Walmart; Gemalto; Intel; and Denver-based start-up Bext360. The selected cases were used to compare BT adoption in a variety of industries such as the food, pharmaceutical, diamond, wine, and coffee industries and cybersecurity-related initiatives. Based on DOI theory and the analysis

of cases, Kshetri (2018) revealed that blockchain will primarily transform the SC processes by addressing issues related to communication. The industry which will be significantly impacted by blockchain is the food industry. And the tech, auto, and garment industries as well as the oil-trading sector are the most suitable ones for blockchain-based SC products due to a smaller number of suppliers. So the examples derived from these case studies prove the ability of blockchain to reduce costs, eliminate manual paper-based processes, automate SC processes, and allocate the proper amount of resources (Kshetri, 2018, p. 86). Meanwhile, there are many challenges, for example, the need for a high level of computerisation and the requirements for parties operating in the global SC to comply with diverse institutions, laws, and regulations.

TAM/TPB/TRI

Kamble et al. (2019) tried to understand the user perceptions of blockchain technology through the example of 181 SC practitioners in India by assimilating the constructs of three adoption theories – technology acceptance model, technology readiness index (TRI) – and the theory of planned behaviour (TPB). The TAM is the most widely used model in a diverse set of technologies and users. It

measures the developing attitude towards the behavioural intention and the perceived ease of use and perceived usefulness (Davis, 1989). The TPB is the extended version of the theory of reasoned action (TRA), and it measures the impact of perceived behavioural control and subjective norms on the adoption process (Ajzen, 1991). And the TRI model contains four sub-dimensions: two motivators of the technology – optimism and innovativeness, and two inhibitors – discomfort and insecurity. The technology readiness index measures the perceived risks that inhibit general technology adoption (Parasuraman, 2000). Thus, Kamble et al. (2019) adopted the two TRI's constructs of discomfort and insecurity, which act as the inhibiting factors during blockchain adoption in supply chains. The results of the statistically validating model revealed the insignificant effect of the discomfort and insecurity constructs on the perceived ease of use and usefulness, while the perceived usefulness, attitude, and perceived behavioural control affect the behavioural intention and the subjective norms negligibly impact the behavioural intention. The findings indicated that SC practitioners perceive blockchain adoption to be free of effort and that their activities should concentrate on "making blockchain more user-friendly" and easier to use (Kamble et al., 2019, p. 2026). The authors advised the companies that have successfully implemented blockchain in SCs to share their stories and explain its benefits in comparison to traditional SCs.

UTAUT
The unified theory of acceptance and use of technology was proposed by Venkatesh et al. (2003) to research technology acceptance. The model is an extension of existing models, including the TAM, DOI, TRA, and TPB, whose limitations the UTAUT tries to address. Venkatesh et al. (2003) identified four constructs which are direct determinants of user acceptance and usage behaviour – performance and effort expectancy, social influence, and facilitating conditions – and the model is moderated by gender, age, experience, and voluntariness (p. 447). This influential model has been employed in a number of studies on adopting new technology. Regarding blockchain adoption, the constructs of this framework and other main adoption theories have been tested by multiple authors (Kamble et al., 2019; Queiroz & Wamba, 2019; Wong et al., 2020a, 2020b).

To understand blockchain adoption behaviour in the SC management domain, Queiroz and Wamba (2019) proposed a model on a modified version of the classical unified theory of acceptance and use of technology with the integration of two new constructs: trust of SC stakeholders and blockchain transparency. The authors combined the extant literature on supply management and blockchain and, mainly, on network theory and the TAM, with particular attention on UTAUT and UTAUT2 (Venkatesh et al., 2003, 2012), and conducted cross-cultural research on adoption behaviours between India- and US-based professionals. Firstly, network theory aids in explaining the complexity of interfirm relationships and cooperation

as well as the impact of external variables on technology adoption. Within SCM, blockchain can transform the relationships among network members, optimise transaction costs, and improve efficiency. The UTAUT allows a better understanding of employees' motivations for adopting blockchain (Queiroz & Wamba, 2019, p. 73). The results show that there are differences in blockchain adoption behaviour among SC professionals in India and the US, but both Indian and American respondents are reluctant to exchange data with their SC members.

In order to predict blockchain adoption intention in the SCM, Wong et al. (2020b) extended the UTAUT model by omitting the construct social influence (SI) and including the additional exogenous constructs of technology readiness, technology affinity, and trust as well as adopting regulatory support as the moderating variable instead of the UTAUT model's primary moderators. After statistically testing the proposed model based on data collected from 157 firms in Malaysia, the authors revealed the incapacity of the UTAUT to predict the adoption of immature technologies and the insignificance of trust but found the direct impact of such constructs as the facilitating conditions, technology readiness, and technology affinity on blockchain adoption in SCM. Therefore, following the meaning of these three determinants, the behavioural intention of the firm mainly depends on the right infrastructure and resources and the main personnel's propensity and interest in exploring new technologies as well as on external stakeholders' support in terms of regulatory authorities and safe practices (Wong et al., 2020b, p. 2114). The authors advocated the need for integration of inter- and intra- organisational parties to adopt BT in SCM. The authors suggested that those companies planning to adopt blockchain technologies should increase the level of this technology's awareness and develop the required expertise, trust, and environment towards successful implementation.

The TOE framework
Clohessy et al. (2019) earlier revealed important technological, organisational, and environmental blockchain adoption considerations that can serve as a foundation for advancing research on the blockchain adoption in organisations. By applying innovation theory and the TOE framework, Clohessy et al. (2019) conducted a comprehensive review of the blockchain-related literature and identified the top three organisational considerations – organisational readiness, top management support, and organisational size – which were used as mediating concepts in the research. From the technological and environmental perspectives, several key considerations such as perceived benefits, complexity, and compatibility as well as the market dynamics and the regulatory environment were specified. One of the main findings was the important role of top management support in incrementally adopting this technology.

Due to disregard of the organisational and environmental factors by the UTAUT and the TAM, Wong et al. (2020a) adopted the technology, organisation, and

environment framework to analyse the effects of relative advantage, complexity, upper management support, cost, market dynamics, competitive pressure, and regulatory support on blockchain adoption for OSCM among Malaysian small- and medium-sized enterprises. Based on the innovation adoption theory, the TOE framework was developed by Tornatzky et al. (1990) to consider the technological, environmental, and organisational factors that influence the decision to adopt technological innovations. Unlike the traditional models such as TAM, UTAUT, and DOI, Wong et al. (2020a) referred to the TOE framework by stressing the combination of human and non-human factors into a single framework, thereby offering a more holistic view of technology adoption among small and medium-sized enterprises. SMEs comprise a group of economic actors that lack resources for technological investments; meanwhile, they must also adhere to the same requirements for optimising the business process and effectively managing their resources. This is when blockchain may come into play to support SMEs' sustainability, owing to the technology's features of transparency, immutability, and security. According to the findings, constructs of the research model such as competitive pressure, complexity, cost, and relative advantage have significant effects on behavioural intention, whereas market dynamics, upper management, and regulatory support are found to be insignificant predictors. Wong et al. (2020a) concluded that blockchain technology has the potential to solve many problems of enterprises, for example, via improving SC traceability. However, its adoption requires a gradual process through collaboration between various internal functional divisions and external members because of blockchain's complexity, uncertainty, and security concerns, as well as the higher costs inherent in implementing this technology.

The IOS adoption theory

Furthermore, Sternberg et al. (2020) also emphasised that blockchain technologies entail a network effect in supply chains. This means that the value of one organisation adopting blockchain is limited, as the technology yields benefits only when multiple members in a network – stakeholders and value chain partners – adopt this technology. In this research, blockchain was considered an interorganisational system; therefore, the adoption of blockchain in SCs was studied from the perspective of the IOS adoption theory proposed by Iacovou et al. (1995). The reasons for selecting and developing this IOS adoption model were due to its main determining factors such as perceived benefits, organisational readiness, and external pressure that are the positive IOS factors of adoption as well as its ability to address the negative IOS factors of adoption – perceived obstacles, external resistance, and organisational immaturity. Based on the single-case study on ReLog's vine supply chain, Sternberg et al. (2020) proposed an interorganisational adoption model and identified four specific phenomena of blockchain adoption between organisations in SCs: the trust – investment paradox and the traceability – efficiency, visibility

– privacy, and performance – commitment tensions occurring between positive and negative IOS factors of adoption (p. 13). In conclusion, the authors highlighted the necessity to consider both the benefits and challenges that the adoption of blockchain causes in SCM. And from the human-centric view, they emphasised privacy concerns, especially among SC employees, as one of the greatest blockchain-related issues.

Comparison of studies on BT adoption conducted under interpretivist and positivist paradigms

The potential of blockchain to alter SCM and logistics is one of the fields which was studied from the lenses of different theories, including mainly transaction cost theory and principal-agent theory, but also other technology adoption theories (Ahluwalia et al., 2020; Kamble et al., 2019; Queiroz & Wamba, 2019; Schmidt & Wagner, 2019; Treiblmaier, 2018; Wong et al., 2020a, 2020b) within the positivist paradigm. For instance, the study of Kamble et al. (2019) is a clear example of research conducted in the framework of the functionalist paradigm. The authors aimed to analyse the factors which affect the acceptance of blockchain in SCs. For this purpose, a unified research model integrating the different constructs of three adoption theories – TAM, TPB, and TRI and the related hypotheses – was tested by applying such quantitative techniques as confirmatory factor analysis and structural equation modelling (see Table 2). The target audience consisted of SC practitioners whose perception was studied to understand the adoption process of blockchain technology in the area of the SC. To examine the relationships among the proposed parameters, an online survey was conducted with the participation of 181 SC professionals representing 102 (manufacturing, technology, or logistics) companies from 4 major cities of India (Kamble et al., 2019).

This quite large sample size and the applied standardised measures, as well as the statistically validated model, corresponded to the requirements of research within the positivist paradigm. The findings revealed that the TRI constructs (insecurity and discomfort) had an insignificant effect on affecting the behavioural intentions of the SC practitioners, while the constructs of TAM and TPB – perceived usefulness, attitude, and perceived behaviour control – were the most critical ones in explaining behavioural intention for blockchain adoption in SCs. In general, perceived usefulness helped build the attitude towards blockchain adoption, which the SC practitioners perceived effortlessly. These practitioners were familiar with this technology; however, they lacked practical knowledge and experience regarding its further implementation that made them consider both the advantages and issues pertinent to introducing BT into SC.

In contrast, the interpretive paradigm is also well-suited to research a new and underinvestigated area. An alternative approach to examine the implications of blockchain in transforming the contemporary SC within the interpretive paradigm was provided by Wang

et al. (2019). The authors applied a well-established sensemaking theory (Weick, 1990; Weick et al., 2005) in organisation and management studies to analyse how SC practitioners developed assumptions and knowledge about the technology of blockchain which later shaped their actions. The aim of Wang et al. (2019) was to interpret the future impact of blockchain technology on the SC domain by focusing on individual sensemaking of SC experts, that is, the way these practitioners make sense of the nascent technology. The data collection technique applied in this research was semi-structured interviews, which are common for qualitative research and the interpretive paradigm. The data were gathered from 14 interviews, a small sample size that nevertheless is considered acceptable for conducting research under the interpretive paradigm. This example illustrates how the researchers interpreted the reality (blockchain adoption) from the perspectives of participants (14 subject matter experts) through a sensemaking process rather than a hypothesis testing process. Wang et al. (2019)

were interested in local understandings of specific uses in a certain field. Based on the individual sensemaking and the practitioners' interpretations, the individual cognitive maps were constructed for every interviewee. After collecting and comparing all codes, they were grouped into such categories as benefits, applications, and challenges' frames, and the collective cognitive mapping was created as a data analysis technique. The narrative analysis was the second method of data analysis, which was an iterative process of moving back and forth between the collected data, the literature on blockchain, and Wang et al.'s emerging framework of sensemaking (Wang et al., 2019, pp. 226 – 228). The research demonstrated that the SC practitioners tended to first understand the usage of technology and then gradually implemented small-scale applications of blockchain rather than make radical changes.

Thus, both research studies, carried out either in the positivist or interpretive paradigms and in the same time period, have considerable explanatory power in relation

Table 2.

Comparison of the adoption of blockchain technology in the context of supply chains within positivist and interpretive paradigms

Characteristics of articles	PARADIGMS	
	Interpretive	**Functionalist**
Authors/Year/Title	Wang et al. (2019): Making Sense of Blockchain Technology: How will it transform supply chains?	Kamble et al. (2019): Understanding the Blockchain Technology Adoption in Supply Chains-Indian Context.
Journal (country/rank)	*International Journal of Production Economics* (The Netherlands / Q1)	*International Journal of Production Research* (The UK / Q1)
Theoretical framework	sensemaking theory	TAM, TPB, TRI
Research type	– qualitative, explorative approach	– quantitative research
Aim	– explore how emerging BT technology may transform SC – examination of individual sensemaking of SC practitioners	– understand the blockchain adoption process in SCs – analyse the factors which affect the acceptance of BT in SCs
Data collection method	– semi-structured interviews	– online survey (to examine the relationship between constructs; 33 parameters proposed in the research model)
Sample size	– 14 SC experts: senior executives/managers from the UK, Germany, Switzerland, Indonesia, Romania, and Portugal who had in-depth domain knowledge in SCM with a sufficient understanding of IT	– 181 SC professionals representing 102 companies (manufacturing, technology, and logistics) from 4 major cities of India (Mumbai, New Delhi, Bangalore, and Chennai)
Data analysis	– narrative analysis – cognitive mapping: individual maps – a collective strategic map – iterative process of moving back and forth	– model and hypotheses testing with confirmatory factor analysis – use of AMOS 21 to conduct structural equation modelling
Contribution	– extension of sensemaking theory: contribution to the emerging field of behavioural operations research by applying sensemaking theory to gain insights into how SC actors make sense of the emerging technology – preparation of industries' practitioners to adopting BT, which is disruptive technology for some of the domains – further insight for the stream of technology adoption studies	– identification of the critical constructs for successful adoption of BT in SCs and the development of the SC practitioner's behavioural intentions on adopting BT – the study advances the literature of technology adoption and tests a unified model integrating the theories of TRI, TAM, and TPB

Source: Table created by the author based on Kamble et al. (2019) and Wang et al. (2019).

to blockchain technology adoption, and they aimed at preparing SC practitioners to implement this technology (Table 2). This indicates that the same phenomenon can be studied in the framework of different theoretical perspectives and paradigms. The analysed studies have mixed assumptions that can reinforce each other; however, this would need additional discussion.

Conclusion and future research directions

The academic works here were discussed through the lenses of technology adoption theories and sensemaking theory as an alternative option. Regarding the area of supply chain management, the studies analysed behavioural intention and behavioural expectation in adopting the technology of BT as well as the factors that influence the decision to incorporate this technological innovation.

The widely used theories regarding blockchain are the DOI, the TAM, the UTAUT, the TOE framework, and the IOS adoption theory that were frequently employed in examining the supply chain area. The analysis of academic papers reveals that some authors tended to integrate several theories and then propose and test the modified research models. For instance, Clohessy et al. (2019) combined innovation theory and the TOE framework, while Queiroz & Wamba (2019) integrated the constructs of the UTAUT and network theory to outline the complexity of intercompany relationships. Some researchers found that supply chain practitioners saw the adoption of blockchain as a process that requires little effort (Kamble et al., 2019), while others warned about the need to consider both benefits and challenges related to blockchain adoption (Sternberg et al., 2020). However, there was a consensus that this complicated technology should gradually be implemented (Kamble et al., 2019; Wang et al., 2019; Wong et al. 2020a). For the successful acceptance of technology in SCM, the right infrastructure and resources, awareness and knowledge among employees (Wong et al., 2020b), and the support of top management and external network members (Wong et al., 2020a, 2020b) are required.

Following the position of Vegh and Primecz (2019), I tried to avoid being driven by the paradigm taxonomy, and instead the study was primarily guided by two research questions. The purpose of the article was to review the results of existing studies on BT acceptance and compare them with academic works carried out within the functionalist and interpretive paradigms. The findings showed that the majority of studies in the field of blockchain technology management had been done within the functionalist paradigm. Research studies completed in the framework of these two paradigms were the most appropriate for analysing the new opportunities created by blockchain and users' perception to it. Due to the multiparadigm reviews, a multiplicity of data collection and data analysis techniques as well as a cross-fertilisation of ideas might enrich the elaboration of the relatively new research field on blockchain technology incorporation.

The research outcomes support the argument of Vegh and Primecz (2019) that organisation studies should be based on predefined research questions and not on paradigm assumptions, as there is no need for such works to be grounded in the paradigm debates. This review of technology adoption theories may help organisations develop their strategies for new technology introduction and understand the attitude of their personnel to the technology.

Thus, because this research contains a review of blockchain from the lens of technology adoption theories and sensemaking theory, it is recommended that future research continue the analysis from the perspectives of other organisation theories and concepts and derive classifications of them. Given the infancy of blockchain technology, most studies have explored prior attitudes towards BT adoption, which is why further research can be devoted to studying the post-adoption process throughout multiple industries.

References

Ahluwalia, S., Mahto, Raj V., & Guerrero, M. (2020). Blockchain technology and startup financing: A transaction cost economics perspective. *Technological Forecasting & Social Change*, *151*, 119854. https://doi.org/10.1016/j.techfore.2019.119854

Ajzen, I. (1991). The theory of planned behaviour. *Organisational Behaviour and Human Decision Processes*, *50*(2), 179 – 211. https://doi.org/10.1016/0749-5978(91)90020-T

Alkhater, N., Walters, R., & Wills, G. (2018). An empirical study of factors influencing cloud adoption among private sector organisations. *Telematics and Informatics, 35*(1), 38– 54. https://doi.org/10.1016/j.tele.2017.09.017

Ardalan, K. (2011). Globalization and information technology: Four paradigmatic views. *Technology in Society*, *33*(1 – 2), 59 – 72. https://doi.org/10.1016/j.techsoc.2011.03.006

Barley, S. R. (1986). Technology as an occasion for structuring: Evidence from observations of CT scanners and the social order of radiology departments. *Administrative Science Quarterly, 31*(1), 78. https://doi.org/10.2307/2392767

Baum, J. A. C., & Haveman, H. A. (2020). Editors' comments: The future of organisational theory. *Academy of Management Review*, *45*(2), 268 – 272. https://doi.org/10.5465/amr.2020.0030

Briner, R. B., & Walshe, N. D. (2014). From passively received wisdom to actively constructed knowledge: Teaching systematic review skills as a foundation of evidence-based management. *Academy of Management Learning & Education*, *13*(3), 415 – 432. https://doi.org/10.5465/amle.2013.0222

Burrell, G., & Morgan, G. (1979). *Sociological paradigms and organisational analysis: Elements of the sociology of corporate life*. Heinemann. https://doi.org/10.4324/9781315242804

Butler, T., & Murphy, C. (2007). Understanding the design of information technologies for knowledge management in organisations: A pragmatic perspective. *Information Systems Journal*, *17*(2), 143 – 163.
https://doi.org/10.1111/j.1365-2575.2007.00237.x

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*, 55 – 81.
https://doi.org/10.1016/j.tele.2018.11.006

Chia, R. (2003). Organisation theory as postmodern science. In H. Tsoukas & Ch. Knudsen (Eds.), *The Oxford handbook of organisation theory* (pp. 113 – 140). Oxford University Press.
https://doi.org/10.1093/oxfordhb/9780199275250.003.0005

Clohessy, T., Acton, T., & Rogers, N. (2019). Blockchain adoption: Technological, organisational and environmental considerations. In H. Treiblmaier & R. Beck. *Business transformation through blockchain*, *1* (pp. 47 – 76). London: Palgrave Macmillan.
https://doi.org/10.1007/978-3-319-98911-2.

Crosby, M., Nachiappan, Pattanayak, P., Verma, S., & Kalyanaraman, V. (2016). Blockchain technology: Beyond bitcoin. *Applied Innovation, 2*, 6 – 9.

Cunliffe, A. (2011). Crafting qualitative research: Morgan and Smircich 30 years on. *Organisational Research Methods*, *14*(4), 648 – 673.
https://doi.org/10.1177/1094428110373658

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319 – 339.
https://doi.org/10.2307/249008

Demeter, K., & Losonci, D. (2020). Business and technological perspectives of Industry 4.0 A framework for thinking with case illustration = Az Ipar 4.0 üzleti és technológiai vetületei Gondolkodási keret esettanulmánnyal illusztrálva. *Vezetéstudomány - Budapest Management Review*, *51*(5), 2 – 14.
https://doi.org/10.14267/VEZTUD.2020.05.01

Donaldson, L. (2003). Organisation theory as a positive science. In H. Tsoukas & Ch. Knudsen (Eds.), *The Oxford handbook of organisation theory* (pp. 39 – 62). Oxford University Press.
https://doi.org/10.1093/oxfordhb/9780199275250.003.0002

Folkinshteyn, D., & Lennon, M. (2016). Braving bitcoin: A technology acceptance model (TAM) analysis. *Journal of Information Technology Case and Application Research*, *18*(4), 220 – 249.
https://doi.org/10.1080/15228053.2016.1275242

Frizzo-Barker, J., Chow-White, P. A., Adams, P. R., Mentanko, J., Ha, D., & Green, S. (2020). Blockchain as a disruptive technology for business: A systematic review. *International Journal of Information Management*, *51*, 102029.
https://doi.org/10.1016/j.ijinfomgt.2019.10.014

Gao, L., & Bai, X. (2014). A unified perspective on the factors influencing consumer acceptance of Internet of things technology. *Asia Pacific Journal of Marketing and Logistics, 26*(2), 211 – 231.
https://doi.org/10.1108/APJML-06-2013-0061

Gioia, D. A., & Pitre, E. (1990). Multiparadigm perspectives on theory building. *The Academy of Management Review, 15*(4), 584 – 602.
https://doi.org/10.5465/amr.1990.4310758

Grover, P., Kar, A. K., & Janssen, M. (2019). Diffusion of blockchain technology. *Journal of Enterprise Information Management, 32*(5), 735 – 757.
https://doi.org/10.1108/jeim-06-2018-0132

Hart, C. (1998). *Doing a literature review: Releasing the social science research Imagination.* Thousand Oaks: Sage.

Hatch, M. J., & Yanow, D. (2003). Organisation theory as an interpretive science. In H. Tsoukas & Ch. Knudsen (Eds.), *The Oxford handbook of organisation theory* (pp. 63 – 87). Oxford University Press.
https://doi.org/10.1093/oxfordhb/9780199275250.003.0003

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, 49*, 114 – 129.
https://doi.org/10.1016/j.ijinfomgt.2019.02.005

Iacovou, C. L., Benbasat, I., & Dexter, A. S. (1995). Electronic data interchange and small organisations: Adoption and impact of technology. *MIS Quarterly, 19*(4), 465 – 485.
https://doi.org/10.2307/249629

Iansiti, M., & Lakhani, K. R. (2017). The truth about blockchain. *Harvard Business Review, 95*(1), 118 – 127.

Kamble, S., Gunasekaran, A., & Arha, H. (2019). Understanding the blockchain technology adoption in supply chains-Indian context. *International Journal of Production Research, 57*(7), 2009 – 2033.
https://doi.org/10.1080/00207543.2018.1518610

Kane, E. (2017). *Is blockchain a general-purpose technology?* http://dx.doi.org/10.2139/ssrn.2932585

Kitchenham, B., & Brereton, P. (2013). A systematic review of systematic review process research in software engineering. *Information and software technology, 55*(12), 2049 – 2075.
https://doi.org/10.1016/j.infsof.2013.07.010

Kshetri, N. (2018). 1 Blockchain's roles in meeting key supply chain management objectives. *International Journal of Information Management*, *39*, 80 – 89.
https://doi.org/10.1016/j.ijinfomgt.2017.12.005

Lewis, M., & Kelemen, M. (2002). Multiparadigm inquiry: Exploring organisational pluralism and paradox. *Human Relations*, *55*(2), 251 – 275.
https://doi.org/10.1177/0018726702055002185

Lewis, M. W., & Grimes, A. J. (1999). Building theory from multiple paradigms. *The Academy of Management Review*, *24*(4), 672 – 690.
https://doi.org/10.5465/amr.1999.2553247

Nakamoto, S. (2008). *Bitcoin: A peer-to-peer electronic cash system*. https://bitcoin.org/bitcoin.pdf

Ozdagoglu, G., Damar, M., & Ozdagoglu, A. (2020). The state of the art in blockchain research (2013 – 2018): Scientometrics of the related papers in Web of Science and Scopus. In U. Hacioglu (Ed.), *Digital Business Strategies in Blockchain Ecosystems* (pp. 569 – 599). Cham: Springer Nature Switzerland. https://doi.org/10.1007/978-3-030-29739-8_27

Pan, X, Pan, X., Song, M., Ai, B., & Ming, Y. (2020). Blockchain technology and enterprise operational capabilities: An empirical test. *International Journal of Information Management*, *52,* 101946. https://doi.org/10.1016/j.ijinfomgt.2019.05.002

Parasuraman, A. (2000). Technology readiness index (TRI): A multiple-item scale to measure readiness to embrace new technologies. *Journal of Service Research*, *2*(4), 307 – 320. https://doi.org/10.1177/109467050024001

Pilkington, M. (2016). Blockchain technology: Principles and applications. In F. Olleros & M. Zhegu (Eds.), *Research handbook on digital transformations* (pp. 225 – 253). London: Edward Elgar. https://doi.org/10.4337/9781784717766.00019

Prasad, P., & Prasad, A. (2000). Stretching the iron cage: The constitution and implications of routine workplace resistance. *Organisation Science*, *11*(4), 387 – 403. https://doi.org/10.1287/orsc.11.4.387.14597

Puel, J. M., Chreng-Messembourg, D., & Cota, B. (2020). Enterprise blockchain 2020. Data driven insights into the uncharted enterprise blockchain world & data economy. *LeadBlock Partners*. Retrieved from http://leadblockpartners.com/docs/Enterprise%20Blockchain%202020%20-%20LeadBlock%20Partners.pdf

Queiroz, M. M., & Wamba, S. F. (2019). Blockchain adoption challenges in supply chain: An empirical investigation of the main drivers in India and the USA. *International Journal of Information Management, 46*, 70 – 82. https://doi.org/10.1016/j.ijinfomgt.2018.11.021

Rogers, E. M. (1995). *Diffusion of innovations,* 12. Free Press.

Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2018). Blockchain technology and its relationships to sustainable supply chain management. *International Journal of Production Research, 57*(7), 2117 – 2135. https://doi.org/10.1080/00207543.2018.1533261

Schmidt, C. G., & Wagner, S. M. (2019). Blockchain and supply chain relations: A transaction cost theory perspective. *Journal of Purchasing and Supply Management*, *25*(4). https://doi.org/10.1016/j.pursup.2019.100552

Somin, S., Altshuler, Y., Gordon, G., Pentland, A. S., & Shmueli, E. (2020). Network dynamics of a financial ecosystem. *Scientific Reports*, *10*, 4587. https://doi.org/10.1038/s41598-020-61346-y

Sternberg, H. S., Hofmann, E., & Roeck, D. (2020). The struggle is real: Insights from a supply chain blockchain case. *Journal of Business Logistics*, 1 – 17. https://doi.org/10.1111/jbl.12240

Sun, S., Cegielski, C. G., Jia, L., & Hall, D. J. (2018). Understanding the factors affecting the organisational adoption of big data. *Journal of Computer Information Systems, 58*(3), 193 – 203. https://doi.org/10.1080/08874417.2016.1222891

Swan, M. (2015). *Blockchain: Blueprint for a new economy*. O'Reilly Media.

Tornatzky, L. G., Fleischer, M., & Chakrabarti, A. K. (1990). *The process of technological innovation.* Lexington Books.

Treiblmaier, H. (2018). The impact of the blockchain on the supply chain: A theory-based research framework and a call for action. *Supply Chain Management*, *23*(6), 545 – 559. https://doi.org/10.1108/SCM-01-2018-0029

Vegh, D., & Primecz, H. (2019). The importance of paradigm reflexivity in the era of evidence-based management. *Academy of Management Proceedings, 1*, 11340. https://doi.org/10.5465/ambpp.2019.11340abstract

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425 – 478. https://doi.org/10.2307/30036540

Venkatesh, V., Thong, J., & Xu, X. (2012). Consumer acceptance and user of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, *36*(1), 157 – 178. https://doi.org/10.2307/41410412

Wamba, S. F., & Queiroz, M. M. (2020). Blockchain in the operations and supply chain management: Benefits, challenges and future research opportunities. *International Journal of Information Management, 52*, 102064. https://doi.org/10.1016/j.ijinfomgt.2019.102064

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*(C), 221 – 236. https://doi.org/10.1016/j.ijpe.2019.02.002

Weick, K. E. (1990). Technology as equivoque: Sensemaking in new technologies. In P. S. Goodman & L. S. Sproull (Eds.), *Technology and organisations* (pp. 1 – 44). Jossey-Bass.

Weick, K. E., Sutcliffe, K. M., & Obstfeld, D. (2005). Organising and the process of sensemaking. *Organisation Science*, *16*(4), 409 – 421. https://doi.org/10.1287/orsc.1050.0133

Wong, L. W., Leong, L. Y., Hew, J. J., Tan, G. W. H., & Ooi, K. B. (2020a). 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. https://doi.org/10.1016/j.ijinfomgt.2019.08.005

Wong, L. W., Tan, G. W. H., Lee, V. H., Ooi, K. B., & Sohal, A. (2020b). Unearthing the determinants of blockchain adoption in supply chain management.

International Journal of Production Research, 58(7), 2100 – 2123.
https://doi.org/10.1080/00207543.2020.1730463

Yli-Huumo, J., Ko, D., Choi, S., Park, S., & Smolander, K. (2016). Where is current research on blockchain technology? – A systematic review. *PLoS ONE, 11*(10), e0163477.

https://doi.org/10.1371/journal.pone.0163477

Zhu, J., & Liu, W. (2020). A tale of two databases: The use of Web of Science and Scopus in academic papers. *Scientometrics, 123*, 321 – 335.

https://doi.org/10.1007/s11192-020-03387-8