

Blockchain implementation for sustainable supply chain management

by

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Abstract

Blockchain application has implications for achieving a sustainable supply chain management (SSCM) system in industries where the technology has gained expressions. However, there are not so many real-life use cases of blockchain-managed supply chains and further research is needed in this domain to increase blockchain usage. This thesis therefore explores the contribution of blockchain implementation to SSCM through novel theorization and conceptualisation of constructs as well as empiricising three research questions. Basically, the study contains three related articles proposed to increase the understanding of blockchain adoption for supply chain sustainability. The first article positions blockchain technology as a social capital which supply chain entities could deploy to gain sustainability. The second article investigates the individual and organisational behavioural factors guiding blockchain adoption for supply chain sustainability, while the third article explores the role of blockchain technology in driving a sustainable supply chain network by stimulating managerial responsibility. Results of the three articles express the central idea that blockchain enhances sustainability in supply chains. The models and propositions emanating from the findings of this thesis offer new insights and illuminates the pathway through which blockchain enhances sustainable supply chain system. It also offers managers new rationales for considering blockchain in managing supply chains.

Keywords: Agrifood industry, behavioural antecedents, blockchain, digital supply chain, responsible management, social capital, supply chain sustainability.

Dedication

To God Almighty, whose grace and mercy brought me this far; to my mother whose early impetus created the appetite for excellence, and to the memory of my dad.

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Table of Contents

Abstract	ii
Dedication	iii
Acknowledgement	iv
Table of contents	v
List of tables	viii
List of figures	ix
List of abbreviations	x
Chapter 1 Introduction	1
1.1 Background to the study	1
1.2 History and definitions of blockchain	3
1.3 Features of blockchain	5
1.4 Types of blockchain	7
1.5 Research problem	8
1.6 Theoretical perspectives	12
1.7 Structure of the thesis	13
References	15
Chapter 2 Blockchain Technology, Social Capital and Sustainable Supply Chain Management	20
2.1 Abstract	20
2.3 Introduction	21
2.4 Theoretical background	24
2.4.1 Digitalisation and blockchain technology in SSCM	24
2.4.2 Digital supply chain social capital	27
2.4.3 Conceptual model	29
2.5 Method	29
2.6 Results	35
2.6.1 Top sustainability objectives targeted with the use of blockchain	35
2.6.2 Effect of technological integration on SSCM	37
2.6.3 Dimensions of social capital in a digital supply chain	38
2.6.4 Integrating digital social capital with sustainability objectives	40
2.7 Discussion and conclusions	41
2.7.1 Theoretical and practical implications	42
2.7.2 Limitations and suggestions for further research	43
References	44
Chapter 3 Behavioural antecedents to blockchain implementation in supply chain management	55
3.1 Abstract	55
3.2 Keywords	55

3.2 Introduction	56
3.3 Materials and methods.....	58
3.4 Results	62
3.4.1 The emerging themes	62
3.4.1.1 Technological benefits.....	63
3.4.1.2 Organisational adoption strategies.....	63
3.4.1.3 Environmental barriers	63
3.4.1.4 Implementation intention.....	64
3.4.2 Themes integration	64
3.4.3 Intentions to implement blockchain technology in agri-food supply chain...	65
3.4.4 Technological benefits-blockchain implementation intention.....	67
3.4.5 Environmental barriers-blockchain implementation intention	68
3.4.6 Organisational adoption strategies-blockchain implementation intention.....	69
3.5 Discussion.....	70
3.6 Conclusions.....	74
3.7.1 Theoretical contributions	74
3.7.2 Managerial implications.....	76
3.7.3 Limitations and suggestions for further research	77
References	78
Chapter 4 Communicating responsible management and the role of blockchain technology: Social media analytics for the luxury fashion supply chain.....	84
4.1 Abstract.....	84
4.2 Keywords	84
4.3 Introduction.....	85
4.4 Theoretical background.....	89
4.4.1 Responsible management: Origin and related concepts.....	90
4.4.2 Using social media to promote responsible management.	92
4.4.3 Sustainable supply chain management: Drivers, consequences, and related field.....	93
4.4.4 The role of blockchain in responsible management and SSCM	96
4.5 Methods.....	99
4.5.1 Social media analytics.....	99
4.5.2 Data collection and measures.....	101
4.6 Results.....	105
4.6.1 Responsible management practices.....	105
4.6.2 Integrating responsible management and SSCM	107
4.6.3 The manufacturer segment.....	108
4.6.4 The retailer segment.....	109

4.6.5 The supplier segment..	110
4.6.6 The distributor segment...	110
4.6.7 The overall integration	110
4.6.8 The effect of digital technology on responsible management.....	111
4.7 Discussion and conclusions	113
4.7.1 Theoretical and practical implications	114
4.7.1.1 Theoretical contributions	115
4.7.1.2 Managerial implications.....	116
4.7.2 Limitations and suggestions for further research	118
References.....	119
Chapter 5 Summary, conclusions and suggestions for further research	132
5.1 Summary	135
5.2 Contributions to theory	134
5.3 Practical implications.....	135
5.4 Suggestions for further research... ..	136

List of Tables

1.1 Definitions of blockchain.....	4
2.1 Research trends for digital technologies and SSCM.....	26
2.2 Cases	33
2.3 Constructs and measures	34
2.4 Sustainability objectives, digital supply chain social capital and data extract.....	36
3.1 Integrated themes, underlying codes, and sample references	64
4.1 Constructs	98
4.2 Supply chain segments, responsible management practices, description, and data extract	105
4.3 Managers' segments on the supply chain, sustainability, and responsible management	108
4.4 Summary of managers' sentiments on the role of blockchain in responsible management.....	112

List of Figures

1.1 Features of blockchain	5
1.2 Blockchain adoption for sustainable supply chain management	13
2.1 Methodological framework.....	32
2.2 Resource-based view of social capital in a digital supply chain management system.....	41
3.1 Methodological approach.....	61
3.2 Thematic map of the themes as identified from available data.....	67
4.1 The social media Analytical process.....	101
4.2 Summary of managers' sentiments on the role of blockchain in managerial responsibility.....	112

List of Abbreviations

BRT: Behavioural Reasoning Theory

DEMATEL: Decision Making Trial and Evaluation Laboratory

DOI: Diffusion of Innovation

RBV: Resource-Based View theory

SCM: Supply Chain Management

SCT: Social Capital Theory

SSCM: Sustainable Supply Chain Management

TAM: Technology Acceptance Model

TOE: Technology, Organisation and Environment theory

TPB: Theory of Planned Behaviour

TRA: Theory of Reasoned Action TRA

TRI: Technology Readiness Index

UTAUT: Unified Theory of Acceptance and Use of Technology

Chapter 1. Introduction

1.1 Background to the study

The advent of blockchain technology into the global corporate space heralded a period of industrial revolution with significant transformations that are crucial for business development and general value chain improvement. With its distributed decentralised architecture, blockchain helps cut through the complexities associated with traditional Supply Chain Management (SCM) including transparency (Gligor et al., 2021; Bai & Sarkis 2020), trust (Dubey *et al.*, 2020), visibility (Rogerson & Parry 2020) data security (Raddatz *et al.*, 2021) as well as institutional inadequacies (Kshetri, 2021). Supply chain firms have therefore continued to restructure their strategies and processes by leveraging blockchain technology and this has continued to attract research interest among SCM scholars (Giri & Manohar 2021) with studies investigating the adoption determinants, benefits, and barriers in SCM (Alazab *et al.*, 2021; Caldarelli *et al.*, 2021).

Notwithstanding the many benefits of blockchain identified in the literature (see Chen *et al.*, 2020), and several architectural frameworks proposed for blockchain utilization (for example, Saurabh & Dey 2021), there are still few practical real-life cases of blockchain implementation in supply chains (Giri & Manohar 2021; Moosavi *et al.*, 2021) and the technology has almost become a cliché in certain settings. Additionally, despite the number of research about the deployment of blockchain in supply chains, certain issues remain unresolved. For instance, studies on blockchain adoption have overly engaged Technological Acceptance Models (TAMs) and the Unified Theory of Use and Acceptance of Technology (UTAUT) which do not account for behavioural determinants such as reasons for or against blockchain adoption. Besides, some of the industry-specific rationales for blockchain implementation are still unidentified while a lot of studies have concentrated on other elements of supply chain management to the neglect of sustainability which is a key concern

of supply chain management (Jabbour *et al.*, 2020). Moreover, the intrinsic qualities of blockchain such as the dimensions of social capital embedded in a blockchain-managed supply chain are yet to be explored in the literature, and the importance of enhancing sustainability by communicating the role of blockchain technology on social media is still greatly underestimated.

To realise a sustainable supply chain management system, it is no longer feasible for supply chain partners to assume that their individual sustainability initiatives will just effortlessly suit the interests of end-users as or fit into the broad objective of the general supply chain. Hence, it is pertinent for supply chain entities to embrace a system that enables the affiliation of their objectives, strategies, and processes to the broad sustainability goals of the network. This is to ensure that value co-creation for stakeholders and supply chain sustainability remain the focal points of supply chain management (Feizabadi *et al.*, 2021). To realise this, firms resort to digital technologies like blockchain for effective coordination and the achievement of supply chain management objectives, top among which are improved firm performance and supply chain sustainability (Di Vaio & Varriale, 2020). Essentially, the features of blockchain which will later be explicated in this Chapter are useful for business process revolution, efficient collaboration, and improved relationship among supply chain partners (Wong *et al.*, 2020B).

Before introducing the research problems this thesis seeks to address, it is apt to dig into the historical foundations, definition, features and types of blockchain technology, as discussed in subsequent sections. This is to further boost the theoretical understanding of blockchain and elucidate its functionalities within the supply chain setting.

1.2 History and definitions of blockchain

Historically, the concept of blockchain takes its origin in the financial sector when Satoshi Nakamoto (pseudonym of a yet to be verified individual or group of persons) developed the bitcoin paper titled, 'Bitcoin: a peer-to-peer electronic cash system' (Nakamoto, 2008), from which the first blockchain database was created (Heister & Yuthas, 2020). The paper was aimed at eliminating the double spending problem of finance as well as designing a payment system that would eliminate intermediaries like banks and other financial institutions. One of the early applications of blockchain technology was the development of cryptocurrencies such as Bitcoin. In fact, there is a myth that blockchain is the same as bitcoin. However, this is not the case as blockchain is the technology on which Bitcoin and other cryptocurrencies operate (Alazab *et al.*, 2021).

Several authors have attempted to define blockchain as compiled in Table 2.1. For instance, Blockchain is defined as a distributed ledger technology where participants store data and perform business transactions (Moosavi *et al.*, 2021). Records kept on the blockchain are secure, reliable and could not be reversed. Contrary to the traditional centralised database system, the blockchain is a distributed decentralised ledger technology that operates through a consensus mechanism in which transactions are verified by all participants in the network. Usually, data is stored on a network of computers known as nodes.

Lakhani & Iansiti (2017) expounds blockchain as an online open source distributed ledger where transactions between different stakeholders could be recorded and updated simultaneously and in real time. Following a similar narrative, Treiblmaier, (2018) defines blockchain as a digital, decentralised, and distributed ledger in which transactions are chronologically lodged and added to create permanent and immutable records.

Table 1.1. Definitions of Blockchain

S/N	Definitions	References
1	A distributed ledger technology where participants store data and perform business transactions.	Moosavi <i>et al.</i> , 2021;
2	An online open source distributed ledger where transactions between different stakeholders could be recorded and updated simultaneously and in real time.	Lakhani & Iansiti 2017
3	A digital, decentralised and distributed ledger in which transactions are chronologically lodged and added to create permanent and immutable records.	Treiblmaier, 2018
4	A revolutionary new protocol for sharing and updating information by linking ledgers or databases in a decentralised peer-to-peer open access network.	Upadhyay <i>et al.</i> , 2021
5	A decentralized ledger that contains transactions as data blocks; with blocks linked to their predecessors by a cryptographic pointer.	Kouhizadeh <i>et al.</i> , 2021
6	A modern internet-based technology that stores transactional data in blocks which can be shared among supply chain members to gain better visibility and transparency.	Sheel & Nath, 2019
7	A technology that enables immutability, and integrity of data in which a record of transactions made in a system are maintained across several distributed nodes that are linked in a peer-to-peer network.	Viriyasitavat & Hoonsopon (2019)

Source: Author's compilation

With respect to supply chain, blockchain is defined as a modern internet-based technology that stores transactional data in blocks which can be shared among supply chain members to gain better visibility and transparency (Sheel & Nath, 2019). Blockchain according to Upadhyay *et al.*, (2021) is a revolutionary new protocol for sharing and updating information by linking ledgers or databases in a decentralised peer-to-peer open access network.

1.3 Features of blockchain

Indeed, blockchain possesses some unique features which make the technology fascinating for business applications and more importantly, supply chain processes. Figure 1.1 presents some of the relevant characteristics with respect to supply chain management.

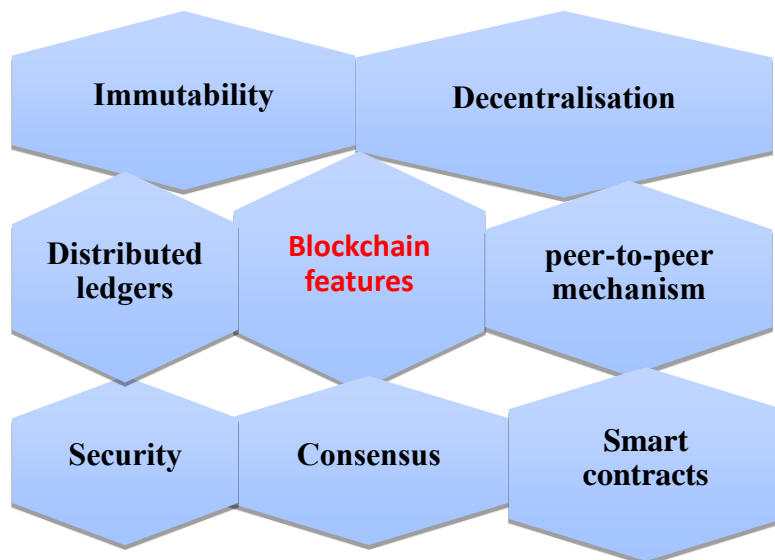


Fig 1.1 Features of blockchain

Source: Author's elaboration

1.3.1 Immutability

On the blockchain, transactional records are stored in blocks held by members and could be added chronologically to form chains. Upon ratification by all members, information stored on the blockchain cannot be erased or tampered-with. This unique quality is referred to as

immutability and this makes blockchain a suitable technology for record keeping (Sheel & Nath, 2019). In other words, blockchain technology is immutable in that the records are held in a distributed ledger system, thus making it impossible for one participant to unilaterally alter information on the network.

1.3.2 Decentralisation

Information stored on the blockchain is collectively maintained by every participant on the blockchain thus ensuring dispersed authority in the system (Saurabh & Dey 2021). This feature ensures that all the firms operating in a supply chain network have equal control over supply chain data.

1.3.3 Consensus

Transactions on the blockchain must be ratified and validated by all partners in the network following a predefined consensus protocol. Transactions are converted into block by the nodes and new blocks are added to the chain through a process of consensus involving validation by all stakeholders (Viriyasitavat & Hoonsopon 2019). Consensus mechanism ensures a system whereby it is practically impossible for one member of the network to unilaterally make decision without the agreement of other parties.

1.3.4 Distributed ledgers

All member of the network has a record of transactions on their respective computers and any additional transaction is visible to and verifiable by every network member (Khanfar *et al.*, 2021). Through this quality, transactions are kept transparent to every supply chain network member.

1.3.5 *Peer-to-peer mechanism*

Amidst similar digital technologies, a distinctive feature of blockchain is its peer-to-peer distributive structure (Chen *et al.*, 2020). While other digital systems have a centralised authority which is saddled with control over other partners, blockchain possesses an architecture that enables decentralised control. Therefore, instead of one party enjoying autonomous control with regards to data storage and information access, every participant on the blockchain has a complete copy of all recorded transactions.

1.3.6 *Smart contracts*

Similar to traditional contracts, blockchain also has a digital version of the predefined terms of agreement for striking business transactions. The protocols for executing business deals are cryptographically encrypted on the technology known as smart contract and this ensures that no intermediary is needed before reaching agreements (Alkahtani, *et al.*, 2021).

1.3.7 *Security*

Blockchain guarantees security of data through its distributed ledger technology which ensures that every network participant has a complete record of transactions (Raddatz *et al.*, 2021). Thus, in the case of theft or loss of information by one member, transactions are still secured on the nodes of other participants.

1.4 Types of blockchain

There are two major types of blockchain; public or permissionless and private or permissioned (Kouhizadeh *et al.*, 2021). A public blockchain is one with unrestricted access as any intending user can join the network and utilise the ledger and stored data, just as found in the case of Bitcoin.

A private blockchain, on the contrary, is one in which only permitted users could access the ledger and utilise stored data. While most supply chains prefer private blockchains because of information security since access to the network is restricted to known members, some businesses with special needs prefer a hybrid of private and public blockchain (Kshetri, 2018). Private blockchains are used by one organisation or network of companies in a supply chain (Chen *et al.*, 2020).

1.5 Research Problem

The increasing number of actors and intermediaries along supply chains coupled with its attendant risks and complexities have birthed inconsistent, insufficient, and unreliable channels of information sharing in the traditional supply chain network (Gligor *et al.*, 2021) and this has continued to place demands on stakeholders for new systems of collaborations that would enable proper harnessing of resources and structures as well as articulation of ideas among partners (Rejeb *et al.*, 2021). Similarly, rising pressure from internal and external stakeholders such as governments, activists and consumers for supply chain firms to publicise more of the information about their operations and products have also heightened concerns for increased transparency and visibility along the chain (Gilgor *et al.*, 2021). Not only this, because of the widely dispersed multiple stakeholders, integrating the practices of different partners to achieve sustainability goals in the supply chain could be quite challenging for traditional systems of supply chain management.

Blockchain adoption in supply chains has therefore attracted increased research attention from different scholars across multidimensional fields, albeit, with many theoretical investigations while real-life practical use cases remain meagre. A lot of studies on blockchain application in supply chains have focussed on adoption antecedents (Alazab *et al.*, 2021; Gokalp *et al.*, 2020; Queiroz *et al.*, 2020;), potential benefits and challenges (Chen *et*

al., 2020) and the development of implementation framework (Saberi *et al.*, 2019) while only a few studies have attempted to explore the behavioural intention to use blockchain (Giri & Manohar 2021).

Regarding the outcomes of blockchain implementation in supply chains, some studies have focused on the potentials of blockchain to enhance general performance (Alkahtani *et al.*, 2021), trust and resilience (Dubey *et al.*, 2020) transparency (Bai & Sarkis, 2020; Francisco & Swanson, 2018), visibility (Rogerson & Parry, 2020) while only a few have considered sustainability (Kouhizadeh *et al.*, 2021). In this regard, sustainability, which is one of the core concerns of supply chain management (Else *et al.*, 2022), has not received sufficient attention in the literature (Ruan *et al.*, 2022).

The idea of sustainability is integral to supply chain management because it is difficult to attain the objectives of supply chain management when there are inconsistencies among partners' corporate strategies and business processes used to deliver them. Moreover, achieving alignment among external and internal stakeholders might be impossible when there are problems with transparency and visibility in the supply chain (Wong *et al.*, 2012). Besides, a necessary condition for alignment is free flow and exchange of information among supply chain stakeholders and this is inadequate among supply chain entities. Blockchain has been identified as a technology with potentials to enhance supply chain transparency (Rao *et al.*, 2021) while ensuring effective collaboration among stakeholders (Rejeb *et al.*, 2021). However, what remains vague is the pathway to which blockchain helps stakeholders achieve sustainability. Investigating the behavioural antecedents of blockchain implementation in supply chains could help shed more light on this channel.

Despite the surfeit of literature on blockchain-supply chain management integration, discussions are sparse regarding the influence of blockchain adoption on sustainable supply

chain management (Kshetri 2021), even the available studies in that regard are mostly theoretical (Caldarelli *et al.*, 2021). There is therefore the need for more empirical investigation on the use of blockchain to achieve sustainable supply chain management. Knowledge in this regard would increase the understanding of how blockchain enhances sustainability, yield adoption framework for firms and managers and could also provide additional justifications for blockchain implementation in supply chain management.

Generally, this study investigates three research questions that would be answered through three articles in subsequent chapters.

Research question 1. What role does blockchain technology play in implementing a SSCM system?

The principal aim of this study is to identify the key functionalities of blockchain in SSCM, which is necessary to have the requisite knowledge of whether or not blockchain is actually needful for pursuing sustainability objectives in supply chain management. Such information is germane to setting the backgrounds for successive studies to be conducted later in this thesis, since the broad scope is to examine the contribution of blockchain adoption to SSCM. Therefore, the broad research question is unpacked into three sub-questions. The first question is ‘what are the top sustainability objectives firms pursue with the use of blockchain?’ The second sub-research question is ‘how does technological integration influence SSCM?’ while the third research question is ‘which dimensions of social capital are embedded in a blockchain-based supply chain?’.

Research question 2. How do behavioural factors affect the adoption of blockchain technology in supply chain management?

The main purpose of this second article is to unfold the behavioural antecedents of blockchain implementation in supply chain management from the perspectives of both individual managers and the organisation as a whole. Based on a comprehensive review of literature, I discovered that the adoption factors have been greatly explored using organisational constructs and technological acceptance models such as UTAUT, to the relative neglect of managers' behavioural intentions. Whereas, ascertaining the behavioural factors is germane to increasing blockchain adoption in supply chains because a lot of managers still hold reservations for blockchain technology due to individual convictions, and there is need to fish out the reasons using behavioural theoretical lenses.

Research question 3. How does communicating responsible management and the role of blockchain technology influence SSCM?

The third research question primarily seeks to investigate how social media communications about the role of blockchain technology and responsible management can influence the achievement of a SSCM system. This main objective is bifurcated into two specific objectives. The first is how communications of responsible management influence SSCM while the second objective is the role of blockchain technology in responsible management.

Answering the three research questions above in this thesis holds implications for blockchain and supply chain management literature. First, the study presents novel conceptualisations of sustainability pursuit in a blockchain-managed supply chain by examining the phenomenon from both the individual and organisational perspectives. At the individual level, this study investigates the influence of managerial responsibility on sustainable supply chain management.

At the organisational level, this study examines the contribution of blockchain to supply chain alignment by identifying the top objectives supply chain stakeholders pursue with the

use of blockchain. Further, this study investigates how the antecedents of blockchain adoption such as collaborative organisational structures, technological advantages and environmental barriers influence stimulate the intention to use blockchain for performance enhancement.

1.6 Theoretical perspectives of the study

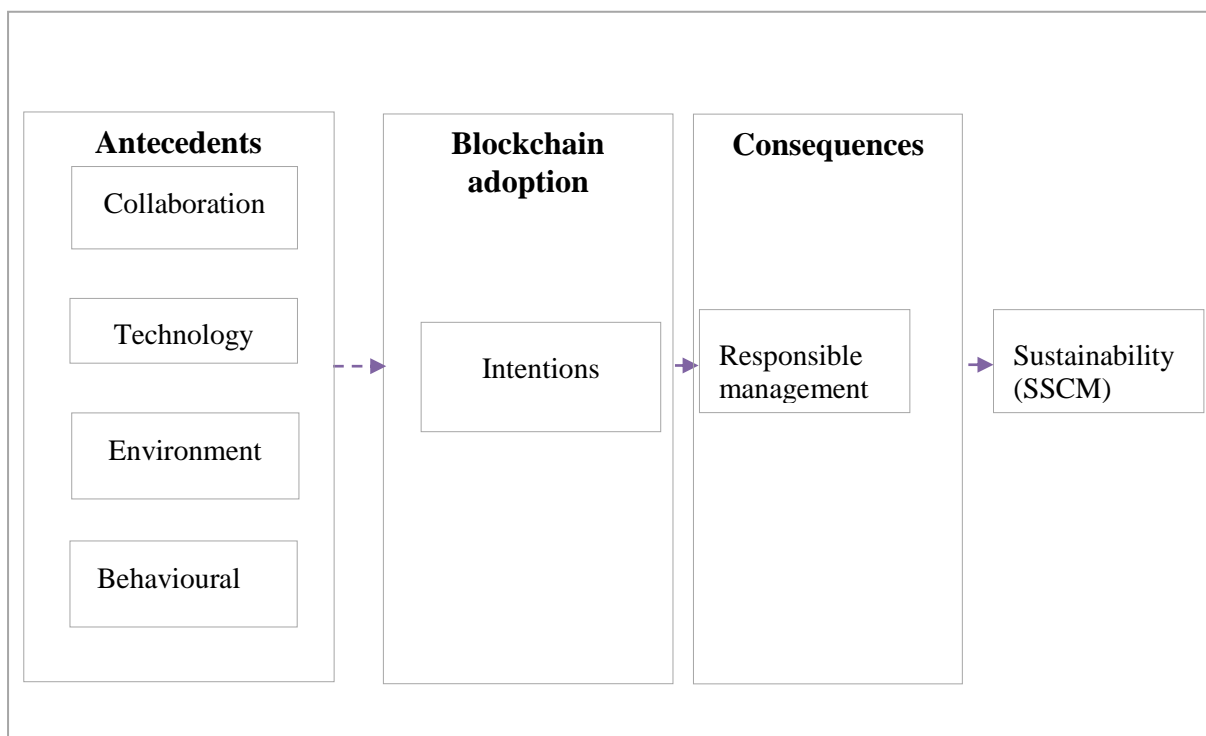
This section highlights the theoretical underpinnings of this study. Extant studies on blockchain adoption in supply chain management have largely employed theories of technology acceptance such as UTAUT, TAMs, Decision Making Trial and Evaluation Laboratory (DEMATEL) and Diffusion of Innovation (DOI). Other theories or framework found relevant for a study of this nature include Social Capital Theory (SCT); Technology Organisation and Environment (TOE); Behavioural Reasoning Theory (BRT); as well as Resource-based View (RBV) theories. Each of the theories mentioned in this section are elaborately expounded in the subsequent chapters.

An overarching observation in the common theories employed in studies of this nature is the continued neglect of the fact that reasons provide a good justification for behavioural intentions (Claudy *et al.*, 2015). Therefore, this thesis leverages four theoretical frameworks, TOE, BRT RBV and SCT, albeit in three related studies, to produce a concept that explains the formation of behavioural intention to adopt blockchain and how the inter-relationship among blockchain-based supply chain actors produces a sustainable supply chain management system.

The TOE framework is used to root the behavioural aspects affecting the application of blockchain to promote sustainable supply chain management. More explicitly, as depicted in Figure 1.2, this study proposes a model that investigates the influence of technology, collaboration, and the environment as antecedents of blockchain implementation intention

just as responsible management emerges as the outcomes towards achieving a sustainable supply chain management system. Invariably, the thesis comprehensively examines the pathway to sustainability in a blockchain-managed supply chain, by positing that collaborations, technology, environment, and individual behaviour are precursors to managers' intention to implement blockchain in SCM and blockchain usage enhances responsible management which is necessary to generate SSCM.

Fig. 1.2 Blockchain adoption for sustainable supply chain management



Source: Author's elaboration

1.7 Structure of the thesis

This section presents the general structure in which the thesis is written. The study comprises five chapters and the content of each chapter is summarised in subsequent paragraphs.

Chapter 1- **Introduction**. The thesis is introduced in this chapter. This entails the presentation of background information regarding blockchain and supply chain management.

The definitions, features and types of blockchain are expounded. The research problems are introduced, and theoretical perspectives are discussed.

Chapter 2- **Blockchain technology, social capital and sustainable supply chain management.** This chapter presents the first paper which is published in *Sinergie Italian Management journal*. In the paper, we explored the nexus of blockchain technology, social capital and sustainability in supply chain management. Integrating the Resource-Based View (RBV) and social capital theories, we present a framework that enables stakeholders consider blockchain a social capital as well as strategic resource which could be leveraged by firms to gain competitive advantage.

Chapter 3- **Behavioural antecedents to blockchain implementation in supply chain management: A thematic analysis.** In this chapter, I present the second article published in the *Technology in society journal*. Considering that there is much awareness about blockchain while practical implementation still remains low and the technology has almost become a cliché, we explore the behavioural factors that shape blockchain implementation intention among managers of the agrifood supply chain.

Chapter 4- **Communicating responsible management and the role of blockchain technology: Social media analytics in the luxury fashion supply chain.** Chapter four contains the third article published in the *Total Quality Management (TQM) journal*. In the paper we explore the role of social media communication of responsible management practices on supply chain sustainability as well as the role of blockchain technology in promoting responsible management in the luxury fashion supply chain.

Chapter 5- **Conclusions.** The study is concluded in this section. The research focus is reintroduced while the contents of the previous chapters are synthesised to iron out the

relevance of this study to both theory and managerial practice. Suggestions are also offered for future research in blockchain technology and sustainable supply chain management.

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Chapter 2

Blockchain Technology, Social Capital, and Sustainable Supply Chain Management¹

2.1 Abstract

Purpose of the paper

This study explicates the contribution of blockchain technology to sustainable supply chain management using the integrated theoretical lens of social capital and resource-based view theories.

Methodology

An abductive approach is employed in which empirical data were obtained from six companies participating in the recently launched Italiafashion project (code-named for the purpose of anonymity) in the Italian fashion industry. Qualitative content analysis was performed on data extracts from the six cases.

Results

Three main sustainability objectives firms pursue with the use of blockchain technology were identified; three propositions also emerged regarding the role of that technology and social capital in sustainable supply chain management.

Research limits

This study employs case study methodology due to its exploratory nature. Future studies could extend the investigation by considering a complete supply chain network with a higher number of observations selected from each category of stakeholders, and the possibility of using quantitative approaches.

Practical implications

This study identifies three key sustainability objectives (product safety, brand authenticity and strategic positioning), which could guide managers when considering the use of blockchain for supply chain management.

Originality of the study

¹ Please be informed that similar version of this chapter (with the same title) has been published in *Sinergie, Italian Management journal*, Vol. 39, Issue 3, 2021. I appreciate my co-authors, Prof. Nadia Di Paola and Prof. Roberto Vona for their assistance. However, I take responsibility for any error observed within the chapter.

A research framework is presented that illustrates the resource-based view of social capital in a digital supply chain management system. We argue that a blockchain-enabled supply chain system bolsters partnering firms with digital supply chain social capital such as improved inter-organisational trust, patterns of connections and shared understandings.

2.2 Keywords

Blockchain, digital supply chain, digital technology, fashion industry, social capital, sustainability.

2.3 Introduction

The emergence of digital technologies has brought substantial improvement to firm performance and global supply chains (Jabbour *et al.*, 2020). In the field of digital technologies, blockchain stands out as one that distinctly constitutes technological disruption with its potential benefits to business operations and general supply networks, which have recently stimulated research attention in the Supply Chain Management - SCM literature (Paliwal *et al.*, 2020; Di Vaio & Varriale, 2020; Nayak *et al.*, 2019). Blockchain has been recognised as enhancing safety, cost control, traceability, provenance and security, among other benefits to supply chains (Kouhizadeh *et al.*, 2020). The essential drivers of sustainability in a blockchain-enabled supply chain have equally been identified to include quality, accessibility, safety and decentralisation of data, among other factors (Yadav & Singh, 2020). The ability of blockchain to reduce carbon emission as a sustainability goal in supply chains has been discussed in the literature (Wang *et al.*, 2020). However, there are other objectives of sustainability that have not received adequate attention in the blockchain/supply chain management research context. Hence, this study resolves to conduct an empirical investigation of the aspect of sustainability that has received the most significant attention from firms with regards to the use of blockchain for managing supply chains. Not only will knowledge in this regard deepen the understanding of blockchain/supply chain integration, but it will also be beneficial for supply chain actors to identify the core aspects of sustainability, with blockchain resources being concentrated for performance optimisation in supply chain management.

Any discussion on supply chain management would be incomplete without considering sustainability (Jabbour *et al.*, 2020), which is the alignment of the triple bottom line of societal (people), economic (profit) and ecological (planet) objectives with corporate practices and the central decision-making processes of partnering firms to improve long-term business and supply chain performance (Krumme, 2019; Orji *et al.*, 2020). Considering the influx of digi-

tal technologies in global businesses, modern industries can no longer be sustained by traditional frameworks and management models (Yadav *et al.*, 2020). The increasing concerns of sustainability along supply chains has therefore necessitated the discovery of new strategies and technological interventions that could produce efficient and innovative solutions to sustainability challenges.

Premised on their capability to facilitate intrinsic connections between an organisation and its customers, suppliers and other actors, as well as their potential advantages of market enlargement, security enhancement, process automation, transparency and provenance along the supply chain, digital technologies like social media, AI, robotics, IoT and blockchain have certain advantages for promoting corporate performance and for supply chain sustainability (Sanders *et al.*, 2019). Furthermore, if combined effectively, some digital technologies could be complementary, and this further enhances sustainable operations through resource circularity in supply chains (De Sousa Jabbour *et al.*, 2018). However, the capability of technological integration to transform supply chain management and facilitate improved sustainability has not been sufficiently explored (Chiang *et al.*, 2021).

Some studies have attempted to test empirically the separate effects of certain digital technologies on sustainable supply chain management (SSCM) (Nasrollahi, 2018; Di Vaio & Variabile, 2020; Choi *et al.*, 2018), and supply chain management areas have been identified to include new product development, sources, making, delivery, retail, return and governance (Macchion *et al.*, 2018). Notwithstanding, a lot still remains unknown about the contributions of digital technologies to supply chain management (Wei *et al.*, 2019), especially which of the identified elements of sustainability receives the most focus from firms in the engagement of digital technologies. Additionally, digital technologies could constitute strategic resources through which firms gain capabilities (Shibin *et al.*, 2020). However, the path to the development of capabilities has not been sufficiently explored in the literature, particularly the role social capital could play in the development of competitive advantages from the use of digital technologies. For example, the competitive advantage added through the use of blockchain is ascribable to its innovative features like decentralised storage and the consensus mechanism of reaching business agreements that accentuate the relationships between supply chain actors, thereby improving social capital in the supply chain. Social capital improvement can be traced along three basic dimensions: structural, relational and cognitive (Zhang *et al.*, 2020). This line of reasoning is, however, yet to receive adequate attention in the blockchain/supply chain management literature.

It is on this note that this study chooses to explore the role of digital technologies in SSCM, and in particular to focus on blockchain technology, highlighting the aspects of sustainability that receive more attention from firms when deploying such technologies. Thus, the following broad research question is raised: what role does blockchain technology play in implementing an SSCM system?

This question will be addressed by examining the following sub-questions:

Q₁: What are the top sustainability objectives firms pursue with the use of blockchain technology?

Q₂: How does technological integration influence SSCM?

Q₃: Which dimensions of social capital are embedded in a blockchain-based supply chain?

The aim of this research is to investigate the sustainability objectives on which firms concentrate their efforts when using blockchain technology, as well as the role of technological integration in SSCM. The topic is investigated in the fashion supply chain, which is very fragmented and looks for new solutions that are able to improve security, sustainability and transparency throughout the chain. The results of this study will expand the frontiers of knowledge on blockchain/supply chain integration in three ways. First, in response to the call for more empirical research on blockchain/supply chain integration (Wei *et al.*, 2019), the role of digital technology, namely blockchain, in implementing an SSCM system is examined. Second, the research question is empiricised using multiple cases selected from the newly launched Italiafashion, from which, to the best of our knowledge, this is the first empirical research study to draw data. Third, while this study is not the first to integrate the resource-based view and social capital theories (See Mora-Monge *et al.*, 2019; Hsu *et al.*, 2014; Rauch *et al.*, 2012), this study contributes to theory by applying the theoretical integration to a specific research problem contextualised in the blockchain/supply chain management system, thus responding to the call by Shibin *et al.* (2020) for a consideration of supply chain social capital in the resource-based view of blockchain-enabled supply chains. Accordingly, the social capital and resource-based theories are integrated to explain the contribution of blockchain technology to SSCM and observe if supply chain social capital plays any role in this linkage. Therefore, this study deepens the understanding of how firms' resources (including digital technology) translate into capabilities and competitive advantages, and this study explores if blockchain is an important resource for developing social capital gains by supply chain firms.

2.4 Theoretical background

2.4.1 Digitalisation and blockchain technology in SSCM

Sustainable supply chains achieve stability in terms of the triple bottom line of economic, social, and environmental factors (Orji et al., 2020), which entails paying enough attention to profit, people, and the planet (Krumme, 2019). As shown in Table 1, studies have recently explored SSCM and digital technologies. For instance, while some studies were conducted broadly on the role of industry 4.0 technologies in creating sustainability (Tuffnel *et al.*, 2019; Bag *et al.*, 2018), others examined the contributions of social media and big data (Jabbour *et al.*, 2020; Sivarajah *et al.*, 2020), while some explored the link between AI and sustainability in supply chains (Dash *et al.*, 2019; Di Vaio *et al.*, 2020). The last category of studies is those that focussed on blockchain, that is “a decentralized, distributed, anonymous, time-stamped ledger of data records” (Sharma et al., 2019: 3). This group of studies includes systematic reviews of the literature to examine the contribution of blockchain to SSCM (Paliwal *et al.*, 2020), those studies that utilised a combination of case study and literature review to explore the antecedents of a blockchain/supply chain management system (for example, Di Vaio & Varriale, 2020), others that presented a concept for blockchain adoption in supply chains (for instance, Saberi *et al.*, 2019) and those that theoretically investigated the success factors for a blockchain-managed supply chain (for example, Yadav & Singh, 2020).

While the link has been explored between the individual digital technologies and SSCM, there is also the possibility of exploring the potential of integrating technologies such as social media and other associated industry 4.0 technologies to further enhance sustainability in digitally enabled supply chain management. Moreover, extant studies have established that the interrelation of digital technologies for supply chain management helps improve financial performance (Ardito *et al.*, 2019) and reduce supply chain risks (Ivanov *et al.*, 2019); nevertheless, there is room for further research on the integration of digital technologies into supply chain management (Jabbour *et al.*, 2020). Furthermore, the need has also been stressed for an investigation of the blockchain-SCM linkage using empirical data (Ardito *et al.*, 2019).

Studies have attempted to provide theoretical underpinnings for the utilisation of digital technologies and other technological innovations in building sustainability in supply chain management. For instance, in the field of engineering management, Choi *et al.* (2018) proposed the “systems of systems” theory for achieving a sustainable fashion supply chain, while Kusi-Sarpong *et al.*, (2019) employed a framework known as the “best-worst multicriteria decision

making model” for evaluating supply chain sustainability in the manufacturing industry. Two theories and one framework, technology-organisation-environment (TOE), human-organisation-technology (HOT) and the best-worst framework were utilised by Orji *et al.* (2020) to identify the essential success factors for the use of social media in creating supply chain sustainability in the freights and logistics industry.

Similarly, with a focus on blockchain, the barriers of digitally enabled supply chain have been investigated through the lens of the decision-making trial and evaluation laboratory framework (Kouhizadeh *et al.*, 2020). The effects of supply chain connectivity and information sharing on SSCM have been measured through a combination of the resource-based view and institutional theory (Shibin *et al.*, 2020), while performance improvements stemming from the acquisition and control of unique resources enabled by the integration of blockchain into supply chain systems has been examined through the theoretical lens of the resource-based view (Nandi *et al.*, 2020). Interestingly, on the one hand, blockchain has been recognised as strengthening supply chain social capital through collaborative inter-organisational relationships by improving trust between partners (Rejeb & Rejeb, 2020). On the other hand, studies have considered blockchain as a unique resource that supply chain firms could leverage to gain competitive advantages and performance improvements (Gölgeci & Kuivalainen, 2020). By extension, blockchain possesses unique features that aid the assessment of product quality, environmental accounting and social impact, thereby promoting SSCM (Kshetri, 2021). However, there is still room for further research regarding the pathways to sustainability gained through the strategic use of blockchain resources in supply chains. An essential consideration in this direction could be the role of social capital in SSCM (Nandi *et al.*, 2020). Traditionally, through its influence on consumers’ buying intentions, social capital has been recognised as a prime driver of sustainability (Kim *et al.*, 2020). Whether or not similar information could be empirically verified about social capital in a blockchain-managed supply chain system is yet to be adequately explored. Against this backdrop, it is conjectured that it is crucial to expand knowledge in the area of blockchain-supply chain management integration by examining, through an integrative philosophical lens of the social capital and resource-based theories, the role of blockchain-enabled social capital in implementing SSCM. Integrating social capital and resource-based theories will provide a theoretical background that further boosts the understanding of the process through which blockchain, as a strategic resource, contributes to sustainability in the supply chain system. Our reasoning is that blockchain has important characteristics capable of enhancing collaborations

between partners (Wang *et al.*, 2020), thereby improving supply chain social capital within the digital system. Intuitively, digital social capital constitutes sources of capabilities for firms to edge out competitors and improve sustainability. Deepening knowledge in this regard could therefore provide novel means of expounding the sustainability gains arising from the use of blockchain for supply chain management.

Incidentally, the literature has stressed the need for more empirical research on how digital technologies promote sustainability in supply chains (Visconti & Morea, 2019), as well as the challenges firms encounter when utilising digital technologies to enhance supply chain management (Vona & Di Paola, 2018; Jabbour *et al.*, 2020). In light of this, the barriers to digitally enabled supply chains fall into four categories: technological, organisational, external environment and supply chain. It has been proven that technological and supply chain barriers are the most critical for both industry and academic practitioners (Kouhizadeh *et al.*, 2020). Despite these barriers, one critical consideration for the adoption of digital technology in supply chain management is its perceived benefits (Orji *et al.*, 2020). We deepen the theoretical proposition by empirically exploring the social capital gains stemming from the integration of blockchain into supply chain systems. This would enable the identification from an empirical perspective of the capabilities firms could attain with the use of digital platforms.

Table 2.1. Research trends for digital technologies and SSCM

S/N	Dimensions	References
1	Industry 4.0 and SSCM	Tuffnell <i>et al.</i> , 2019; Bag <i>et al.</i> , 2018; Yadav <i>et al.</i> , 2020; Mastos <i>et al.</i> , 2020; Bhagawati <i>et al.</i> , 2019; Müller 2020;
2	Big data, social media and SSCM	Jabbour <i>et al.</i> , 2020; Sivarajah <i>et al.</i> , 2020; Chalmeta & Santos-deLeón 2020; Wang <i>et al.</i> , 2016; Tiwari <i>et al.</i> , 2018; Hazen <i>et al.</i> , 2016; Nguyen <i>et al.</i> , 2018; Singh & El-Kassar 2019; Bag <i>et al.</i> , 2020; Nasrollahi, 2018; Orji <i>et al.</i> , 2020; Tseng 2017
3	Artificial intelligence and SSCM	Dash <i>et al.</i> , 2019; Di Vaio <i>et al.</i> , 2020; Govindan <i>et al.</i> , 2019; Baryannis <i>et al.</i> , 2019; Sanders <i>et al.</i> , 2019; Dauvergne 2020)
4	Blockchain and SSCM	Paliwal <i>et al.</i> , 2020; Di Vaio & Varriale 2020; Nayak <i>et al.</i> , 2019; Saberi <i>et al.</i> , 2019, Cole <i>et al.</i> , 2019; Kouhizadeh <i>et al.</i> , 2020; Yadav & Singh 2020.

Source: Author's compilation

2.4.2 Digital supply chain social capital

Social capital theory has transcended its origin in sociology to be relevant in the related fields of economics and business, and it has gained wide application in supply chain management (Johnson *et al.*, 2013) to explain how supply chain firms acquire capabilities through the deployment of valuable resources gained through strategic alliances with internal and external stakeholders (Yim & Leem, 2013). Social capital is a critical element of inter-organisational relationships such as those created between firms in a supply chain (Gölgeci & Kuivalainen, 2020). It refers to the valuable assets arising from access to resources made available through social ties (Nahapiet & Ghoshal, 1998). It is defined as the “sum of the actual and potential resources embedded within, available through and derived from relationships possessed by an individual or social unit” (Nahapiet & Ghoshal, 1998, p. 243). An individual or organisation’s networks of relationship constitute valuable resources through which benefits are derived, including data sharing information access and synchronisation of activities (Kilubi & Rogers, 2018).

Three dimensions of social capital are identified in the literature: structural, relational and cognitive (Zhang *et al.*, 2020; Villena *et al.*, 2011). The structural dimension refers to the strength, pattern and frequency of connections between buyers and sellers. The denser the structure of social relations between supply chain partners, the more regular the connections between individuals in the network and the better the social capital. This connotes that a dense structural social capital helps supply chain stakeholders to collaborate more, and it provides a better medium for information exchange (Wu & Chiu, 2018).

The relational dimension of social capital involves the goodwill that is expressed in the form of the trust, reciprocity and friendship gained as a result of social interactions between buyers and sellers (Alghababsheh & Gallear, 2020). Relational social capital evolves from repeated interactions, which in turn enable trustworthiness among members of the supply chain network. Trust, therefore, is an essential element of relational capital as it reduces information asymmetry in the buyer-supplier relationship (Wu & Chiu, 2018).

The cognitive dimension has to do with shared values, codes, language and common understandings among partners (Barroso-Castro *et al.*, 2016; Lee, 2015). Supply chain actors have their rules of engagement spelled out in a formal contract to ensure orderliness in task execution targeted towards the realisation of their common goals (Jia *et al.*, 2020). Common understanding among stakeholders in a supply chain helps them share the same thinking process

and establish uniform ideologies, thereby facilitating market exchange (Alghababsheh & Gallear, 2020).

Intentionally established networks, such as the supply chain, facilitate the accumulation of the relational, structural and cognitive dimensions of social capital (Ali & Gölgeci, 2021). It is important that supply chain firms create a dense social capital structure that enables a constant flow of knowledge and information sharing by building networks and maintaining frequent interactions, thus fostering cooperation (Gölgeci & Kuivalainen, 2020; Chu *et al.*, 2017). Likewise, the relational dimension of social capital is equally important to supply chain firms because of the need to develop trust and reciprocity from long term partnerships and repeated transactions, thereby reducing transaction costs (Villena *et al.*, 2011; Lee, 2015). In the same vein, supply chain actors need to pay attention to the cognitive dimension of social capital, which includes resources that help them develop shared representation, meanings (Polyviou *et al.*, 2019), goals, visions and understandings regarding the contracting rules and management principles guarding the network (Zhu & Lai, 2019). Therefore, building upon this theoretical foundation, the three dimensions of social capital present in a digital supply chain are investigated.

The literature has linked social capital to firm performance (Lins *et al.*, 2017; Barroso-Castro *et al.*, 2016; Krause *et al.*, 2007) and supply chain sustainability (Zhang *et al.*, 2020; Chu *et al.*, 2017). Social capital has also been acknowledged as one of the strategic resources that supply chain firms can leverage to create competitive advantages and hedge against risks (Gölgeci & Kuivalainen, 2020).

The introduction of digital technologies into supply chains has given rise to digital social capital. Social capital is generated from relationships through exchange (Nahapiet & Ghoshal, 1998). Similarly, supply chain social capital is created through relationships between supply chain partners (Yim & Leem, 2013); one way such relationships are serviced is through the exchange of information (Gölgeci & Kuivalainen, 2020). Digital technologies facilitate the exchange of information between supply chain partners, thereby strengthening the structural and relational dimensions of supply chain social capital. For instance, the blockchain improves the relational dimension by enhancing transparency, trust, safety and provenance in the supply chain, while social media applications such as Facebook, Twitter and Instagram affect the structural dimension of social capital by increasing the volume of transactions and the strength of social ties, influencing the pattern of connection between supply chain actors.

Therefore, the term “digital supply chain social capital” indicates the dimensions of social relationships (in terms of connection pattern, inter-organisational trust and common understanding) between partners that are enabled by the use of digital technologies for supply chain management.

2.4.3 Conceptual model

The resource-based view, which takes its origin from the strategic management literature (Barney, 1991), holds that a firm can attain sustainable competitive advantages by harnessing its unique resources and capabilities (Das & Teng, 2000).

The resource-based view provides the best framework for explaining the pathway to competitive advantages gained through resources (Shibin *et al.*, 2020). Resources in a firm may be tangible (people, assets) or intangible (information, partnerships) and provide useful means for firms to attain capabilities. Studies have identified technology as one of the strategic resources that improves firm value (Sabherwal *et al.*, 2019; Lioukas *et al.*, 2016). Using the resource-based view, Nandi *et al.* (2020) model the performance improvement resulting from a blockchain-enabled supply chain system.

We extend the theoretical proposition in this study by arguing that a blockchain-enabled supply chain system bolsters partnering firms with digital supply chain social capital such as improved inter-organisational trust, patterns of connections and shared understandings.

This is expounded on through a combination of social capital theory and the resource-based view. It is posited that the three dimensions of social capital could be accumulated from an integrated blockchain/supply chain system and that these include digital structural capital (connection patterns enhanced by smart contracts), digital relational capital (inter-organisational trust enabled by distributed ledger technology) and digital cognitive capital (common understandings enabled by the peer-to-peer mechanism through which blockchain operates).

2.5 Method

To answer the research questions, this study employs an abductive approach, which is a research process in which real life issues are explained through an iterative juxtaposition between existing theory and empirical data (Nandi *et al.*, 2020). This approach becomes necessary since this study investigates a complex, emerging phenomenon in which data collection and the search for relevant theories proceeded simultaneously; hence, it is not fit for deduc-

tive or inductive approaches (Dubois & Gadde, 2002). Additionally, the abductive research approach is appropriate for this study since the aim is to make propositions that could aid theory development (Brodie *et al.*, 2017). Moreover, this study seeks to explore a phenomenon (blockchain implementation in supply chain management) that is still in a budding stage.

In line with the abductive research process, this research employs multiple case study analyses, an approach that has been employed in previous sustainability studies of this nature (see Formentini & Taticchi, 2016; Macchion *et al.*, 2018). Case studies are more suitable for answering how, why and what questions in exploratory, explanatory or descriptive research involving contextual conditions where little is known about the subject of enquiry (Baxter & Jack, 2008) as it allows the generation of valuable insights as well as testable propositions that can be subsequently subjected to further empirical validations. Moreover, findings from a multiple case study design are more convincing, and this type of study is generally regarded as more robust compared to a single case design (Yin, 2003). Exploring the contribution of digital technologies to supply chain sustainability using a multiple case study methodology would not only help explicate the pathway through which blockchain influences SSCM but also allow the replication of findings across cases and comparisons with empirical explanations for organisational differences in the use of digital technologies to foster sustainability objectives. Moreover, the specific sustainability objectives firms seek to achieve through the utilisation of blockchain for supply chain processes could be established from multiple sources, just as the role of technological integration in SSCM can be investigated.

To contextualise the research question, the focus here is on the fashion supply chain, where sustainability is essential because of the heavily fragmented and globally dispersed nature of the chain (Choi *et al.*, 2018). More importantly, the adoption of blockchain is gaining importance in the fashion industry due to the need to ensure trust, security and transparency among supply chain partners (Macchion *et al.*, 2018). The significance of the fashion sector to the Italian economy cannot be overemphasised as the phrase “made in Italy” has become synonymous with the Italian luxury industry. To further promote the “made in Italy” brand in the United States of America and across global markets, an Italian institution recently launched a project named Italiafashion, a disguised name used to ensure anonymity. Italiafashion provides a digital platform consisting of a virtual boutique, 3D animations, social media integrations, music, and compelling stories in which designers, retailers, consumers and other stakeholders of the supply chain can connect for business transactions, whether B2B (business-to-business) or B2C (business-to-consumer). Hence, Italiafashion is consid-

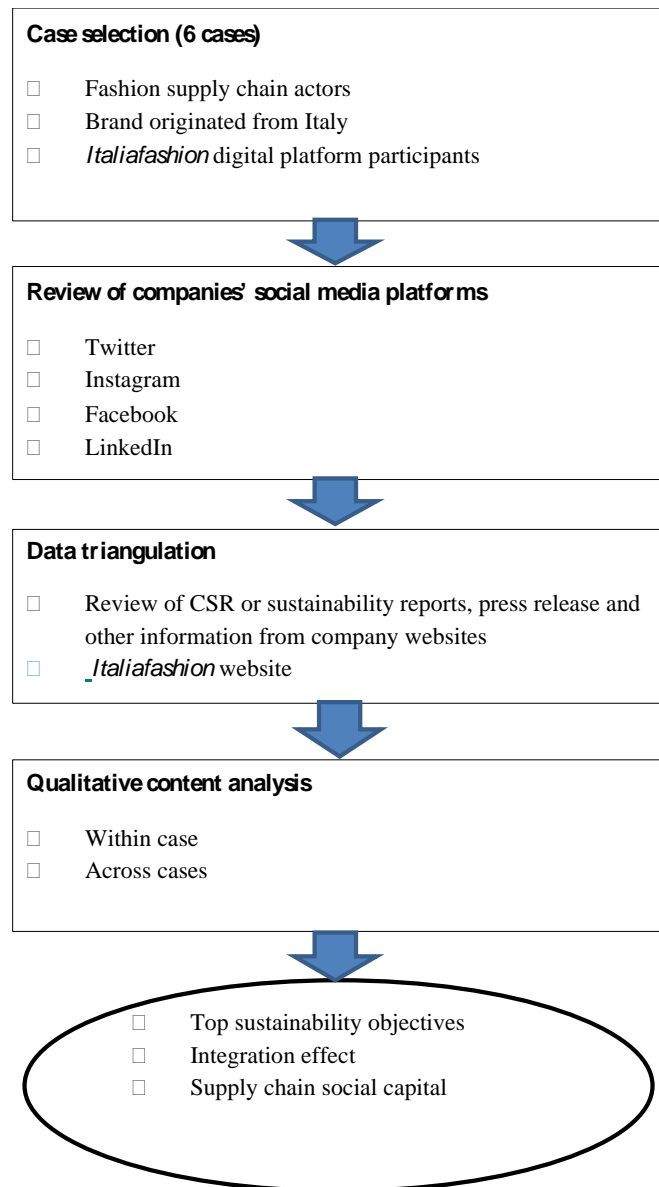
ered a good proxy for technological integration because of its rich blend of digital technologies, blockchain in particular. Against this backdrop, cases were selected from companies participating in the project.

Data for this study were collected in two phases. First, between March and August 2020, prior to the launching of Italiafashion project, the Twitter pages of fashion companies were tracked on an application programming interface known as “followerwonk” using the keywords “fashion”, “blockchain” and “sustainability”. To ensure that only firms operating in the fashion supply chain were captured, Twitter handles were regularly reviewed to verify the pages with information available on the companies’ official websites.

The second phase of data collection took place between September and October 2020, when Italiafashion was already operational. We focussed on companies participating in Italiafashion, leveraging the information available on the project website. Data collected from the platform were triangulated with other sources, including social media pages (Facebook, LinkedIn and Instagram), as well as the 2019 corporate responsibility and sustainability reports of the selected companies.

Following the methodological framework presented in Figure 2.1 and the procedure for conducting multiple case study research, established in Baxter and Jack (2008) and Yin (2003), cases were selected by focussing on companies operating in the fashion supply chain, specifically brands originating in Italy. The criteria for case inclusion were that the company should be participating in the Italiafashion project and, by implication, be a stakeholder in the fashion supply chain, and such company must be operating in a blockchain-managed supply chain system. The information obtained from secondary sources was continually reviewed to identify the firms that met these two criteria.

Fig 2.1. Methodological framework



(Adapted from Macchion *et al.*, 2018)

Source: Author's elaboration

Following this process, from a total of 80 companies participating in the project, only six fashion brands made it into the final analysis. They are labelled A-F for the sake of anonymity, as shown in Table 2.2.

Table 2.2 Cases

Case	Year of establishment	Firm size (No of employees)	Digital technologies
A	1913	Large (14,000)	Blockchain, social media
B	1921	Large (13,030)	Blockchain, social media
C	1925	Large (3,000)	Blockchain, social media
D	1975	Large (7,309)	Blockchain, social media
E	1985	Large (519)	Blockchain, drones, social media
F	1978	Large (1,250)	Blockchain, social media

**Social media here comprises Facebook, Instagram, Twitter and LinkedIn.*

Source: Author's compilation

Using the keywords stated previously, the selected firms' social media and sustainability reports were explored for communications bordering on blockchain and supply chain sustainability. The data extracts were prepared and imported into Nvivo-12, where qualitative content analysis was performed.

For the data analysis, each firm's sustainability objectives were coded with respect to the use of blockchain. Other digital technologies the firms integrated with blockchain in their pursuit of sustainability objectives were also identified. Based on the measures defined in Table 2, the dimension of social capital embedded in the sustainability objectives targeted by the blockchain/supply chain system of each firm was identified. Table 3 gives a summary of the constructs and measures employed in this study.

Table 2.3. Constructs and measures

Constructs	Measure	References
Digital technology	Blockchain adoption	Saberi <i>et al.</i> , 2019; Kouhizadeh <i>et. al.</i> , 2020
Brand authenticity	Product quality	Moulard <i>et al.</i> , 2016; Beverland <i>et al.</i> , 2010
Product safety	Risk level	Zhu <i>et al.</i> , 2019
Positioning	Advertising	Iyer <i>et al.</i> , 2019
Digital structural social capital	Social connection pattern	Gölgeci & Kuivalainen 2020; Lee, 2015;
Digital relational social capital	Trust	Villena <i>et al.</i> , 2011, Yim & Leem 2013
Digital cognitive social capital	Shared understanding	Barroso-Castro <i>et al.</i> , 2016

Source: Author's compilation

A comprehensive assessment of sustainability objectives was conducted to identify the social capital measures contained in each. For example, a consistent indicator of relational social capital in the literature is trust (Weiss *et al.*, 2019; Zhang *et al.*, 2017); therefore, firms whose sustainability efforts are concentrated on improving trust were coded as being focussed on relational social capital, those with the core objective of reshaping the pattern of connection among the supply chain partners were coded as being focussed on structural social capital while those with sustainability goals bordering around common understanding or mutual vision were coded as being oriented towards cognitive social capital. Again, the multiple data sources were continually triangulated to ensure the consistency of the findings. The previously identified sustainability objectives were further integrated with the social capital dimensions to develop the propositions.

2.6 Results

2.6.1 Top sustainability objectives targeted with the use of blockchain

With respect to the first research sub-question, from the case analyses, three categories of sustainability objectives emerged based on firms' use of digital technologies. These are product safety, brand authenticity and strategic positioning.

Product safety is the reduction in the tendency of a product to cause harm, illness, injury, death or other negative consequences to its intended users, property or equipment (Maruchek *et al.*, 2011). Product safety concerns are capable of creating disruptions in supply chains and can result in product recalls; hence, it is widely considered an integral sustainability objective in the fields of operations, risks and supply chain management (Speier *et al.*, 2011). With regards to the fashion industry, safety issues might arise from the use of adulterated supplies, such as harmful chemicals, poor production mechanisms or incorrect packaging in the preparation of textile materials. It is therefore essential for partnering firms to reach consensus on appropriate supplies, adequate packaging and acceptable textile designs with the aim of identifying likely negative consequences for corrective measures before production. Product safety as a sustainability objective that firms target with the use of digital technologies was drawn from sample data:

In order to promote widespread safety awareness, thanks in part to regulatory developments on this matter, the Company uses on-line safety courses with specific IT platforms that are easy and simple to use. (Firm#, sustainability report 2019)

Brand authenticity is a known strategy in the field of marketing and has been incorporated into supply chain management due to the increasing need to curb the problem of counterfeiting in supply chains (Li & Yi, 2017). In the fashion industry, counterfeiting results from deliberate changes to labels, poor branding and other unsustainable practices by one or more elements of the supply chain. Fashion firms therefore desire to safeguard their brands by ensuring that their genuineness is not compromised throughout its movement along the supply chain. Table 2.4 shows that the objective of brand authenticity is the most prevalent among the studied cases, as it is indicated by four (approximately 67%) of the companies.

Table 2.4. Sustainability objectives, digital supply chain social capital and data extract

Cases	Sustainability objectives	Digital supply chain social capital	Reference from cases
A	Product safety	Relational	‘In order to promote widespread safety awareness, thanks in part to regulatory developments on this matter, the Company uses on-line safety courses with specific IT platforms that are easy and simple to use’.
B	Brand authenticity	Relational	‘Protect your Brand from counterfeit, use Authlink to issue a verifiable certificate of authenticity to all products and safeguard your Brand.
C	Positioning	Structural	‘Smart Contracts, Blockchain and hidden advertising on social Media” Conference at Brand# Exploring next generation solutions for luxury business. Great Job...’
D	Brand authenticity	Relational	‘One of the best advantage of #Blockchain is that #Companies can ensure there is no counterfeit products reaches to any consumer.’
E	Brand authenticity	Relational	‘Luxury Brands Authenticity Flourishing with Blockchain http://Blockchain.luxury Premium Domain For Sale.’
F	Brand authenticity	Relational	‘Agreed! Check out how Brand 1, Brand 2, Brand 3, Brand 4, Brand 5 use digital #authentication to protect consumers now. It solves the problem of #counterfeit links to #digital records, so when #Blockchain is ready for prime time, they are too’.
	Sample cases: 35.8%		

Source: Author’s compilation

Here is an example of data from which brand authenticity was identified:

Luxury Brands Authenticity Flourishing with Blockchain <http://Blockchain.luxury>
Premium Domain For Sale. (Brand#, Posted on social media, 7th January 2020)

Strategic positioning, which relates to the development of new products or the discovery of new markets, refers to the way in which a business differentiates itself from its competitors and offers value to a specific category of customers (Guo *et al.*, 2018). In the contemporary business world, where competition is inevitable across supply chains, companies need to develop supply chain differentiation strategies either with respect to price, quality or design in order to increase their chances of long-term survival (Iyer *et al.*, 2019; Aktan & Akyuz, 2017). With more than 80 brands currently competing for the global market on the Italiafashion virtual boutique, positioning strategy remains key for supply chains to attain competitive advantage. An example of data from which positioning was identified as a sustainability objective targeted with the use of blockchain is the following:

Smart Contracts, Blockchain and hidden advertising on social Media” Conference at Fendi Exploring next generation solutions for luxury business. Great Job. (Brand#, Posted on social media, 31st January 2019)

Summarily, as shown in Table 3, In terms of the primary sustainability objectives sought by businesses in their use of blockchain to manage supply chain systems, four of the six cases (B, D, E, and F) prioritise brand authenticity; one (C) specifies strategic positioning; while one (A) recognises product safety as key to its supply chain sustainability.

2.6.2 Effect of technological integration on SSCM

With reference to the second research sub-question, the Italiafashion platform facilitates collaborations along the supply chain, thus enhancing digital supply chain social capital by improving the pattern of connection and increasing the strength of social relations between supply chain stakeholders.

Prior to the launching of the Italiafashion digital platform, there existed a lack of integrated digital platforms for supply chain collaborations. However, with Italiafashion, supply chain collaborations are enhanced by the digital platform.

This is further illustrated by the sample data:

Of course, in the aftermath of the pandemic, with social distancing guidelines and travel restrictions still in place, this opportunity is a major boost for many designers. The digital discovery platform will also seek to help these bright stars grow their businesses in the United States by connecting them with the media, retailers, and consumers. (Italiafashion Website)

The Italiafashion digital platform represents a mix of digital technologies, allowing the exploration of the joint influence of integrated technologies on SSCM, taking references from the data extracts. The findings indicate that the Italiafashion digital platform facilitates supply chain collaborations, which is an indicator of supply chain social capital. By extension, improved collaboration is necessary to sustain the economic and ecological gains resulting from social interactions between supply chain firms. Intuitively, this connotes that technological integration improves sustainability in supply chain management by increasing supply chain social capital.

The importance of integrated digital platforms like Italiafashion cannot be overemphasised, especially in the post-pandemic period where there are social distancing guidelines and less physical interaction is required of businesses and their stakeholders. Essentially, because of the nature of traded goods, the fashion industry is one that requires more interactive and holistic digital platforms with which actors can visualise products and ensure provenance by tracking products' movement along the supply network. Consistent with the findings of Bertola and Teunissen (2018), an ecosystem of digital technologies helps firms to be more customer-oriented, maintain a good positioning strategy, and capture new markets, thereby making the supply chain more sustainable. Hence, a first proposition is made:

Proposition 1: Compared to individual digital technologies, technological integration is more likely to advance SSCM through improved customer orientation, better positioning strategy and increased market access.

2.6.3 Dimensions of social capital in a digital supply chain

In answering the third research sub-question, two dimensions of supply chain social capital were found in the blockchain-managed supply chain system investigated. These are here called digital structural social capital and digital relational social capital. The dimensions differ in the aspect of sustainability that enjoys the most significant focus by the firm in the management of supply chains.

2.6.3.1 Digital structural social capital

Digital structural social capital in this case refers to the blockchain-enabled pattern of connections and the nature of contracts existing within an organisation and its supply chain partners. Table 3 shows that one of the cases (C) is committed to improving the structural dimension of social capital by using blockchain to develop a positioning strategy for its supply

chain. A major constraint on traditional supply chain management systems is the complexity of business processes brought about by the presence of multiple and geographically distributed actors (Sauer & Seuring, 2019). The blockchain, through its decentralised, peer-to-peer system, has brought considerable transformation to the pattern of connection in supply chains by removing the need for intermediaries and facilitating business processes, thus making the system less complex. Moreover, the smart contract feature of the blockchain, which is a set of rules guiding transactions between supply chain participants, operates through consensus mechanisms (Saber *et al.*, 2019) in which transactions are ratified by all parties involved and no actor can alter business processes without the agreement of all partners. Moreover, with the digitised supply chain systems, buyers could trade directly with suppliers, thus significantly altering the pattern of connection and increasing the strength of social relationships between supply chain partners. Similar results were reported by Kim *et al.* (2021), who found that digital healthcare supply chains improve structural capital. Based on this understanding, a second proposition is made:

Proposition 2: Digital supply chain systems are more likely to strengthen structural social capital through smart contracting, which facilitates direct buyer-seller transactions without the need for intermediaries.

2.6.3.2 Digital relational structural capital

Digital relational structural capital has to do with the trust and reciprocity resulting from long-term partnerships. Supply chains are global in nature, involving the participation of several stakeholders, which reduces visibility and transparency along the chain (Di Paola, 2018; Ruta *et al.*, 2017). With the use of digital technology such as blockchain, transactions are managed in a distributed ledger technology that enables verifiability and transparency of business processes (Manupati *et al.*, 2020). More importantly, one of the critical issues blockchain addresses in supply chain management is a lack of trust between partnering firms and end users; blockchain ensures the creation of an immutable record of reliable data (Choi, 2019). The smart contract ensures that consensus is reached for transactions to be validated, and every partner has a digital record of the transaction. Similar advantages are available to end users as the blockchain enables them to verify the origins of products.

Table 2.3 shows that four of the cases indicate brand authenticity as their top sustainability target with respect to the use of blockchain. Embedded in the concept of brand authenticity is trust, which is a key element of relational social capital. This is because for a brand to be con-

sidered authentic, consumers need to have a certain level of trust, believing that the product must have been made with acceptable levels of honesty and transparency, without compromising quality and necessary ethical standards. To ascertain the authenticity of a brand, blockchain provides a robust, immutable system suitable for tracing the movement of products along the value chain. Another sample case (A) recognises product safety as of major concern in blockchain/supply chain integration. Zhang *et al.* (2020B) similarly reported that digital supply chains increase relational social capital. The blockchain enables the monitoring of business processes, thus ensuring compliance with safety standards by all supply chain entities and enhancing transparency and security along the chain. It is on this note that a third proposition is made:

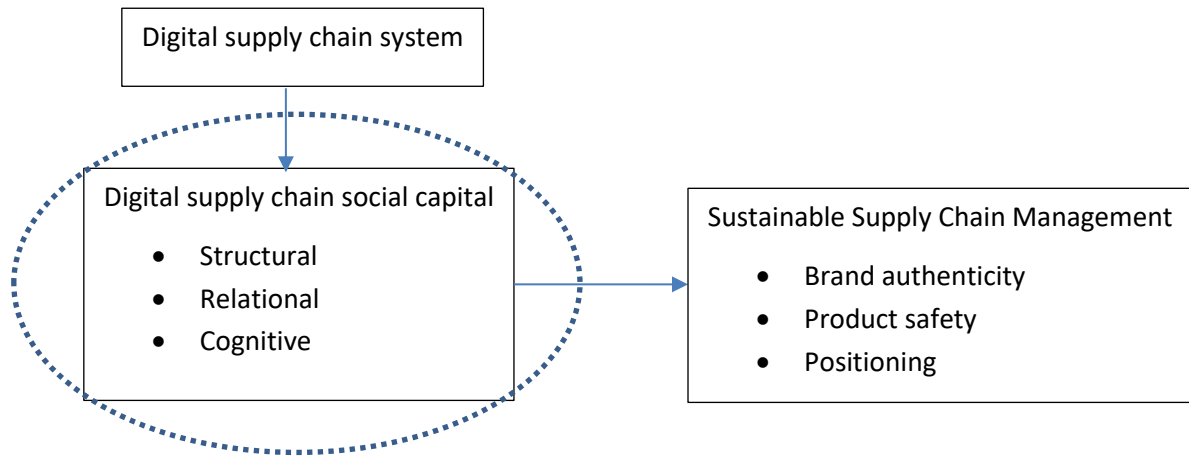
Proposition 3: By improving trust amongst stakeholders, digital supply chain systems are more likely to increase relational social capital than non-digital supply chain systems.

2.6.4 Integrating digital social capital with sustainability objectives

The digital social capital identified is further integrated with the sustainability objectives pursued by firms as identified from the cases. The results are presented in Table 2.4.

Table 2.4 shows that two sustainability objectives are associated with the relational dimension of digital supply chain social capital, and these objectives include brand authenticity and product safety, while only one sustainability objective (positioning) is connected with the structural dimension of digital supply chain social capital. Generally, the two sustainability objectives that are focussed on relational social capital are shared by five of the six companies considered in this study, which is an indication that firms may be more interested in using digital technologies to achieve relational social capital than structural social capital in their supply chains. Implicitly, inter-organisational trust is more important to supply chain firms than their patterns of connection.

Fig 2.2. Resource-based view of social capital in a digital supply chain management system



Source: Author's elaboration

Figure 2.2 shows that the dimensions of social capital in a digital supply chain system are valuable resources that can be leveraged by firms to gain capabilities and are key to implementing SSCM as they influence the achievement of the sustainability objectives established in the supply chain network.

2.7 Discussion and conclusions

Employing a multiple case study approach, this study has explored the role of digital technologies, particularly blockchain technology, in SSCM through the integrated theoretical lens of social capital theory and the resource-based view. Secondary data were obtained from six fashion firms participating in the *Italiafashion* project by retrieving the information made available on their social media accounts, particularly Twitter, which was accessed using an application programming interface. Also, companies' Facebook, Instagram and LinkedIn pages were considered, triangulated with other sources such as sustainability reports, as well as the *Italiafashion* project website, to ensure that the information obtained was genuine. The results of qualitative content analysis conducted on the data extracts suggest that there are three top sustainability objectives firms seek to achieve with the utilisation of digital technology: brand authenticity, product safety and strategic positioning.

Of the three dimensions of social capital considered in this study, only two (structural and relational) were found to be relevant in a blockchain-based supply chain system. This suggests

that blockchain has a profound influence on both structural and relational social capital, but its effect on cognitive capital might be negligible. The rationale behind this is that blockchain, through its unique features such as smart contracts and immutability, can influence the structural and relational dimensions of social capital but has little or no significant influence on shared meanings or common understandings among supply chain partners. A plausible explanation for this finding is that understanding is subjective and can rarely be influenced by a third party application or technology as it depends solely on the subjects. Hence, the influence of blockchain on cognition is rarely felt.

Although not a direct objective of this study, comparisons are drawn across cases to determine which of the three dimensions of social capital are of most importance to firms in the use of digital technologies. The results indicate that the relational dimension of digital supply chain social capital is more important to firms than the structural and cognitive dimensions. Hence, firms are more interested in achieving inter-organisational trust than influencing the pattern of social connections in their supply chains.

In line with the findings of this study, it is recommended that supply chain firms consider the blockchain as a key enabler of social capital and as a major strategic resource that could be integrated with other digital technologies to gain capabilities over competitors and promote the sustainability of the supply chain.

2.7.1 Theoretical and practical implications

This study, which stands at the intersection of digitalisation and SSCM, lends some relevant contributions to the theory and practice of sustainability in supply chains. As a theoretical contribution, this study has synthesised the social capital theory and resource-based view to advance a framework that explicates the contribution of digital technologies to SSCM through the development of social capital, culminating in the emergence of capabilities in an integrated blockchain/supply chain system. Furthermore, this study has also demonstrated that digital technology, specifically blockchain, through its smart contract, helps strengthen structural capital; improves relational capital through its immutability features, which boost trust among supply chain participants; and that technological integration enhances SSCM through improved customer orientation, better positioning strategy and increased market access.

Another theoretical contribution of this study is the advancement of the concept of digital supply chain social capital, which is defined as the dimensions of social relationship (in terms

of connection pattern, inter-organisational trust and shared codes and languages among partners) enabled by the use of digital technologies for supply chain management.

As a practical implication, this study identifies three key sustainability objectives (product safety, brand authenticity and strategic positioning), which could guide managers when considering the use of digital technologies for supply chain management. Invariably, the sustainability objectives identified in this study could constitute the focal points for supply chain managers in the use of blockchain for promoting sustainability. Moreover, extant literature has identified blockchain as a strategic resource that firms can leverage to edge out the competition (Nandi *et al.*, 2020,). This study advances this school of thought by showing that the ability of blockchain to boost social capital and enhance sustainability offers a more lucid explanation to the competitive advantage gained through its use. Consequently, this new line of reasoning holds that the dual complementary roles of blockchain as a strategic resource and a key enabler of social capital help improve sustainability in the supply chains, and this could provide further incentives for stakeholders to consider investing in blockchain for supply chain management.

Therefore, blockchain is not just a vital technological resource but a means of accumulating social capital in supply chain systems, and it can be leveraged to attain competitive advantage. Additionally, this study illustrates the greater influence of integrated technologies on SSCM rather than engaging one type of digital technology. This encourages firms to consider multifunctional digital platforms that holistically incorporate the attributes of different technologies for the management of supply chains. For example, firms could engage blockchain alongside social media platforms to have a more sustainable supply chain.

2.7.2 Limitations and suggestions for further research

This study has certain limitations. First, blockchain remains an emerging technology with an abundance of anecdotes but few real-life use cases, even in the fashion industry where it seems to have gained prominence. Despite the fact that this study considers a real-world experience, however future studies could extend the investigation by considering a complete supply chain network with a higher number of cases selected from each category of stakeholders. Second, this study relies on a case study methodology due to its exploratory nature. Another interesting avenue for further research is to consider a quantitative approach in which surveys could be conducted to collect primary data for a more robust empirical analysis. Particularly, it is suggested that the three propositions made here should be quantitatively

investigated such that the impact of digital technologies on SSCM may be measured while also testing the mediating effect of social capital on the blockchain-SSCM relationship. In this regard, hopefully, pragmatic implementation of blockchain will have matured sufficiently in fashion and other industries in the near future, such that additional studies can heavily rely on interviews with supply chain managers to gain a better understanding of the roles of digital technologies in driving supply chain sustainability.

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Chapter 3

Behavioural antecedents to blockchain implementation in agri-food supply chain management²

3.1 Abstract

Despite its perceived utility, several companies and managers continue to hold reservations about blockchain implementation in supply chain management. To elucidate the causes, we examine the behavioural and organisational antecedents that influence the adoption of blockchain technology in supply chain management. To do this, we undertake thematic analysis on blockchain-related agri-food business news and expert opinions from the Ovid database's Agricola section. Four themes are central to our model: organisational adoption strategies, technical advantages, environmental obstacles, and implementation intention. Using these themes, we build a thematic map and derive three propositions about the role of behavioural antecedents to blockchain implementation intention in supply chains, thus substantiating Behavioural Reasoning Theory (BRT) and Technology Organisation and Environment (TOE) theory's core arguments. Our findings elucidate novel factors influencing blockchain adoption in supply chains. More specifically, we show that managers who consider the technological benefits associated with blockchain capacity are able to provide stakeholders with new opportunities and embrace adoption strategies such as product launch and partnership formation while also considering environmental and contextual barriers such as market fragmentation, scarcity of research, and regulatory restrictions.

Keywords: Agri-food sector, Behaviour, Blockchain, Supply chain management, Partnerships

² Please note that similar version of this chapter (with the same title) has been published in *Technology in Society*, 101927 (2022). Many thanks to my co-authors, Prof. Nadia Di Paola and Prof. Roberto Vona for their assistance. However, I take responsibility for any error observed within the chapter.

3.2 Introduction

Blockchain is regarded as the next disruptive technology after the internet (Chen *et al.*, 2020; Zhao *et al.*, 2016). In managing traditional supply chains with multiple layers of stakeholders, blockchain is able to address counterfeiting and transparency concerns. The smart contracts and distributed ledger features of blockchain technology offer advantages in business process reengineering (Chang *et al.*, 2019; Rozario & Thomas 2019), and this has continued to generate increased research attention from supply chain management scholars (Kohler & Pizzol, 2020; Tonnissen & Teuteberg, 2020). Numerous studies have examined the factors influencing blockchain adoption in businesses (Queiroz & Wamba 2019) and supply chain management (Wong *et al.*, 2020; Vona & Di Paola, 2018; Kouhizadeh *et al.*, 2021; Yadav *et al.*, 2020). Several applications were analysed in the food supply chain (Raddatz *et al.*, 2021), such as the information system architecture for a blockchain-managed supply chain in the grape wine industry (Saurabh & Dey 2021) and a cooperative model for sustainability in e-agricultural supply chain management (Alkahtani *et al.*, 2021). The extant literature on the precursors to blockchain adoption in supply chain management (Queiroz & Wamba 2019; Queiroz *et al.*, 2020; Wong *et al.*, 2020A) has dwelt extensively on the models of technology acceptance, especially the Unified Theory of Acceptance and Use of Technology (UTAUT), which includes behavioural models such as Theory of Planned Behaviour (TPB) and Theory of Reasoned Action (TRA). While the TRA explicates the predictive role of managers' intentions in their implementation behaviour, the TPB maintains that managers who have a positive attitude towards blockchain feel social pressure to implement it, and believe that it is easy to implement, are more likely to invest in blockchain for managing their supply chains.

Additionally, there are strands of studies that focus on the broad framework, adoption determinants, and challenges (Wong *et al.*, 2020B; Kamble *et al.*, 2020; Saurabh & Dey 2021),

with a heavy emphasis on the technology, organization, and environment (TOE) framework and a few studies (Queiroz *et al.*, 2020) on behavioural considerations in blockchain adoption. Despite the amount of research on the deployment of blockchain in supply chains, certain issues remain unresolved. For example, UTAUT, one of the most extensively applied theories, ignores context-specific rationales (or justifications) for implementation behaviour. Thus, the conceptual models used in the studies that incorporated UTAUT generally neglect the notion that reasons are significant determinants of adoption behaviour, as the (BRT)central premise asserts (Claudy *et al.*, 2015). Furthermore, various studies have examined the potential benefits of blockchain deployment in supply chain management, but only a few have attempted to analyse blockchain acceptance based on individual and organisational behaviour (Kamble *et al.*, 2020). Despite the positive research trend, empirical research in this subject is still scarce, as there are few examples of blockchain-based supply chain management in practice (Moosavi *et al.*, 2021), and some of the criteria necessary for effective implementation remain unknown. Furthermore, there is a need for additional empirical investigation on blockchain implementation within specific industries or referring to specific objectives (Wong *et al.*, 2020; Duan *et al.*, 2020; Gokalp *et al.*, 2020).

Our study therefore chooses to advance knowledge in the areas of blockchain and supply chain management by empirically examining the behavioural and organisational factors driving blockchain implementation in agri-food supply chain management. To this aim, we explore the behavioural and organisational factors affecting blockchain implementation by analysing what happens in the agri-food sector, based on data from business news and expert commentaries. This study makes three significant contributions. First, we develop a framework for explaining the behavioural precursors to blockchain implementation through the interaction of individual traits and technical, organisational, and environmental factors. Second, we contribute to managerial practice by increasing the understanding of organisational adop-

tion strategies that determine the success of blockchain implementation in the supply chain and can be influenced by environmental barriers. Third, by examining our research question in the agri-food sector, we uncover new determinants of blockchain adoption in supply chains; our findings are thus useful for stakeholders in the agri-food industry, as they suggest new reasons for blockchain adoption, thereby increasing blockchain utilisation and making the agri-food supply chain more traceable and reliable. In summary, our study is rooted in the idea that intentions are considered a good proxy for studying action (Verma *et al.*, 2018). Following this line of reasoning, we raise the research question:

How do behavioural factors affect the adoption of blockchain technology in supply chain management?

Having introduced the study in this section, the remaining parts are thus structured. Section 2 presents the materials and methods, Section 3 includes the results, Section 4 discusses the findings, and we conclude the study in Section 5.

3.3 Materials and Methods

The purpose of this study is to determine how behavioural factors affect the application of blockchain technology in the agri-food supply chain. Our desire to investigate the behavioural aspects of blockchain implementation in the agri-food supply chain is prompted by several factors. First, the supply chain suffers accountability and traceability issues as a result of the enormous number of people and procedures involved in moving food items from the farm to the market, generating concerns about food safety and global food security. In addition, supply chains are characterised by uncertainties regarding decision-making by stakeholders (Fathollahi-Fard *et al.*, 2021A) thus making the achievement of efficiency a cumbersome process (Mojtahedi *et al.*, 2021). Moreover, it is pertinent to address the challenges of transforming industrial materials and taking them through the supply network, thus necessitating

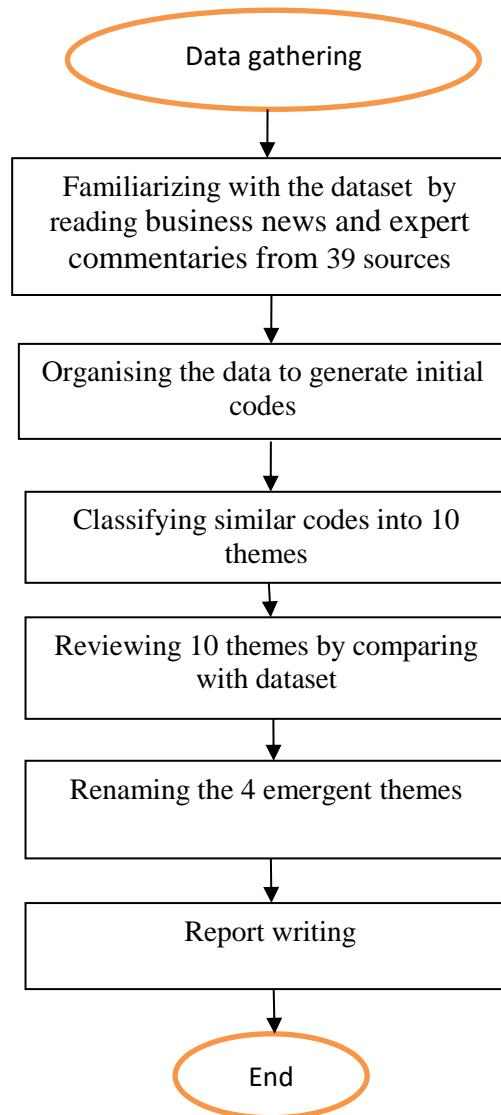
full deployment of the triple bottom line concept to attain sustainable management (Fathollahi-Fard *et al.*, 2021B). Worldwide agri-food production is vulnerable to pests and diseases, weather fluctuations, and high transaction costs. Additionally, the recent epidemic necessitates restricted physical interactions between supply chain entities, hence raising the value chain's uncertainties, risks, and complexities. In this dispensation, digital technologies have proven to significantly influence consumer behaviour (Lioutas, *et al.*, 2021) and supply chain network design (Fathollahi-Fard *et al.*, 2021C). Thus, managing a safe and sustainable agri-food supply chain implies many challenges that can be addressed with the utilisation of blockchain technology. This has aroused research interest among supply chain management scholars. In this regard, the framework, adoption barriers and precursors of blockchain implementation in supply chains have been studied (Kouhizadeh *et al.*, 2021; Yadav *et al.*, 2020; Duan *et al.*, 2020). Some studies take the organisational approach, while only a few approach the subject matter from the individual perspective, and none have integrated both approaches. Therefore, to the best of our knowledge, our study is the first to investigate the organisational and individual behavioural factors affecting blockchain implementation in supply chain management.

We used a qualitative methodology that enables the emergence of generalisable themes from data (Rogerson & Parry, 2020) because blockchain is still a new technology with limited implementation in supply chain management (Kouhizadeh *et al.*, 2021). This is due to the early stages of blockchain implementation in the agri-food supply chain (Stranieri *et al.*, 2021) possibly requiring exploratory analysis. The analysis is therefore based on news from the agri-food value chain extracted from the Ovid database's (Kootstra, 2021) 'agricola media sector', using the keyword 'blockchain' and specifying the publication years as 2018–2020 to guarantee that only recent items are included. This section contains industry news stories

from a variety of media outlets, as well as expert commentaries on the use of blockchain in the agri-food supply chain.

Following the initial search, we manually examined business news and expert commentaries from 77 sources to determine which sources were acceptable for evaluation based on their contents. To avoid reinventing the wheel, we remove journal publications in favour of press releases and business news from renowned international agri-food research institutes, media outlets, agri-businesses, and blockchain service providers. The article ought to incorporate news on blockchain technology and be explicit regarding the agri-food market. The 39 publications that result, which might be considered expert perspectives about blockchain in the agri-food value chain, are combined to produce our dataset, which we imported into NVivo 12 and utilise to perform thematic analysis using Braun & Clarke's six-step procedure (Braun & Clarke, 2006). Our analytical approach is summarised in Figure 3.1.

Fig. 3.1. Methodological approach



(Adapted from (Braun & Clarke, 2006; Sodhi & Tang, 2018))

As depicted in Figure 1, we begin by familiarising ourselves with the dataset's contents, noting any intuitions that occur in response to our predefined research question. We next code the materials in a systematic manner, emphasising major areas of the information, as line-by-line coding is deemed inappropriate given the nature of our dataset. We examined the dataset carefully and produced codes through analysis, conceptualisation, and constant comparison of its contents. We then organised the codes according to topics, which allowed for the formation of new themes. Following that, the themes were examined to ensure that each one

logically captures the underlying codes, is clarified by the dataset's contents, and is also different from the others. By grouping and renaming the themes, explaining their relationships, and deriving meaning from the dataset, we polished them. Finally, we construct narratives that describe the data collection method and analytic results.

3.4 Results

We conduct thematic analysis on our dataset using the six processes stated in (Braun & Clarke, 2006; Clarke & Braun, 2014) and construct a thematic map as described in (Sodhi & Tang, 2018). In the thematic map, links between topics are drawn based on insights from the dataset and existing literature. In general, we ensure validity by situating our study within an established theory (Seuring & Gold, 2012), in this case, a paradigm constructed using a combination of BRT and the TOE framework. This ensures that our measures are comparable. Additionally, we ensure the validity of our findings by ongoing interaction and observation (Nowell *et al.*, 2017). Additionally, by fully recording the actions followed, we make our method traceable and replicable. The themes and their associated codes are summarised in Table 1, as is the relationship between each theme and its implementation aim.

3.4.1 The emerging themes

The analysis of news items reveals four major themes: technological benefits, organisational adoption strategies, environmental barriers, and intentions to implement blockchain. Five more subthemes are woven into these central topics. For example, 'organisational adoption methods' is divided into product launch and partnership strategies, while 'environmental barriers' includes market fragmentation, research intensity, and government regulations.

Theme 1. Technological benefits of blockchain in agri-food supply chains

Agri-businesses accrue numerous benefits due to blockchain technology's technical peculiarities. First, the potential of blockchain to improve agri-food product traceability is a large technological benefit. Additionally, blockchain technology can effectively store data, enabling improved access to protected data at reduced transaction costs. Then, by eliminating the demand-supply gap, enhancing consumer trust, and minimising food waste, blockchain contributes to streamlining supply chain complexity. All of these factors contribute to the overall performance of the supply chain.

The immutability of the blockchain assures data confidentiality and trustworthiness, as no partner has the authority to unilaterally modify any information recorded on it. This ensures that all supply chain stakeholders participate in decision-making, that choices must be unanimous, and that any necessary revisions must be agreed upon by all partners prior to becoming network-binding.

Theme 2. Organisational adoption strategies for blockchain in agri-food supply chains

Adoption strategies refer to the processes and procedures that agri-food companies must follow to become familiar with and continue to use the blockchain. For example, some firms prefer to launch new products or services on the blockchain to increase their patronage by providing an opportunity for customers to become familiar with the technology. Similarly, other businesses build alliances using blockchain, ensuring that the technology is adopted by all organisations in the supply chain.

Theme 3. Environmental barriers to blockchain implementation in agri-food supply chains

Throughout this context, environmental barriers relate to impediments to blockchain adoption in the supply chain that are primarily induced by environmental and contextual factors. Environmental barriers are essentially external constraints in the environment that can obstruct the

operation of the blockchain. First, the agri-food supply chain is defined by geographically dispersed small and medium-sized firms that may lack technology expertise, financial capacity, and other enabling elements. Additionally, because blockchain technology is still in its infancy, additional research is necessary to ascertain how it adapts to and addresses supply chain concerns. Additionally, the government's extensive regulation of blockchain for business purposes may limit the technology's application potential.

Theme 4. Implementation intention

According to behavioural theories, intention is an excellent predictor for actual behaviour. Implementation behaviour is used in this context to refer to managers' intents or mental states on their commitment to using blockchain in supply chain management. Managers agree to deploy blockchain technology after carefully assessing the proper technological, organisational, and environmental considerations. Thus, the implementation objective is an excellent predictor of actual blockchain implementation efforts.

3.4.2 Themes integration

Following the identification of four themes that encompass the behavioural and organisational components of blockchain implementation in supply chain management, we examine how each of the remaining three themes connect to the outcome, namely, the implementation intention. Using existing literature as a guide (Sohdi & Tang 2018), relationships between themes are developed by regular evaluation of their underlying codes and careful observation of the dataset to derive relevant conclusions. For example, as demonstrated by the sample data:

‘Companies are adopting strategies such as product launches, development and partnerships, collaborations, and joint ventures. A large number of players in the market are focusing on establishing partnerships to carry out pilot test projects. This key

strategy has also been on the rise for the successful implementation of blockchain’
(Data extract from *Agricola*).

The relationship between organisational adoption strategies and implementation intention is such that the strategy employed by businesses when deploying blockchain has a significant impact on the outcome of blockchain operations. Having previously shown in the theoretical section that action is a suitable proxy for intention, a successful application of blockchain implies that a predetermination to adopt the technology existed prior to its actual deployment. Intuitively, there is a connection between organisational adoption strategies and the ambition to deploy blockchain, and this connection is such that strategy drives intention. Table 3.1 summarises the connection between themes.

Table 3.1. Integrated themes, underlying codes, and sample references

Integrated themes	Underlying codes	Sample references
Technological benefits- Blockchain implementation intention	Enhanced tracking, efficient storage, immutability, improved data access, new partnership opportunities, information reliability, lower transaction costs, increased commodity movements.	‘Information generated through blockchain about nuances of supply chain can also help the stakeholders identify new opportunities across the globe to comply with customer needs and enable faster adoption of blockchain in the supply chain’.
	Accountability, entangled food chain, supply chain complexities, food borne diseases, food wastage,	‘To counter the concerns such as food wastage, lack of provenance data, delayed payments, and unavailability of crop insurance consumers and other supply chain stakeholders are increasing-

	supply chain efficiency, real-time potential, consumer distrust, commodity sorting, demand-supply gap, stakeholder value	ly demanding for improved transparency in the agriculture and food supply chain. Blockchain technology is pitched to be the leading contender in the agriculture and food system to streamline the handling of all these concerns’.
Environmental barriers – blockchain implementation intention	Market fragmentation, insufficient research, excessive regulations	‘The market is highly fragmented with the presence of a huge number of small to medium sized companies’.
Organisation adoption strategies-Blockchain implementation intention	Partnership establishment, product launches, collaborations.	‘Companies adopting strategies such as product launches, development and partnerships, collaborations, and joint ventures. Large number of players in the market are focusing on establishing partnerships to carry out pilot test projects. This key strategy has also been on a rise for successful implementation of blockchain’.

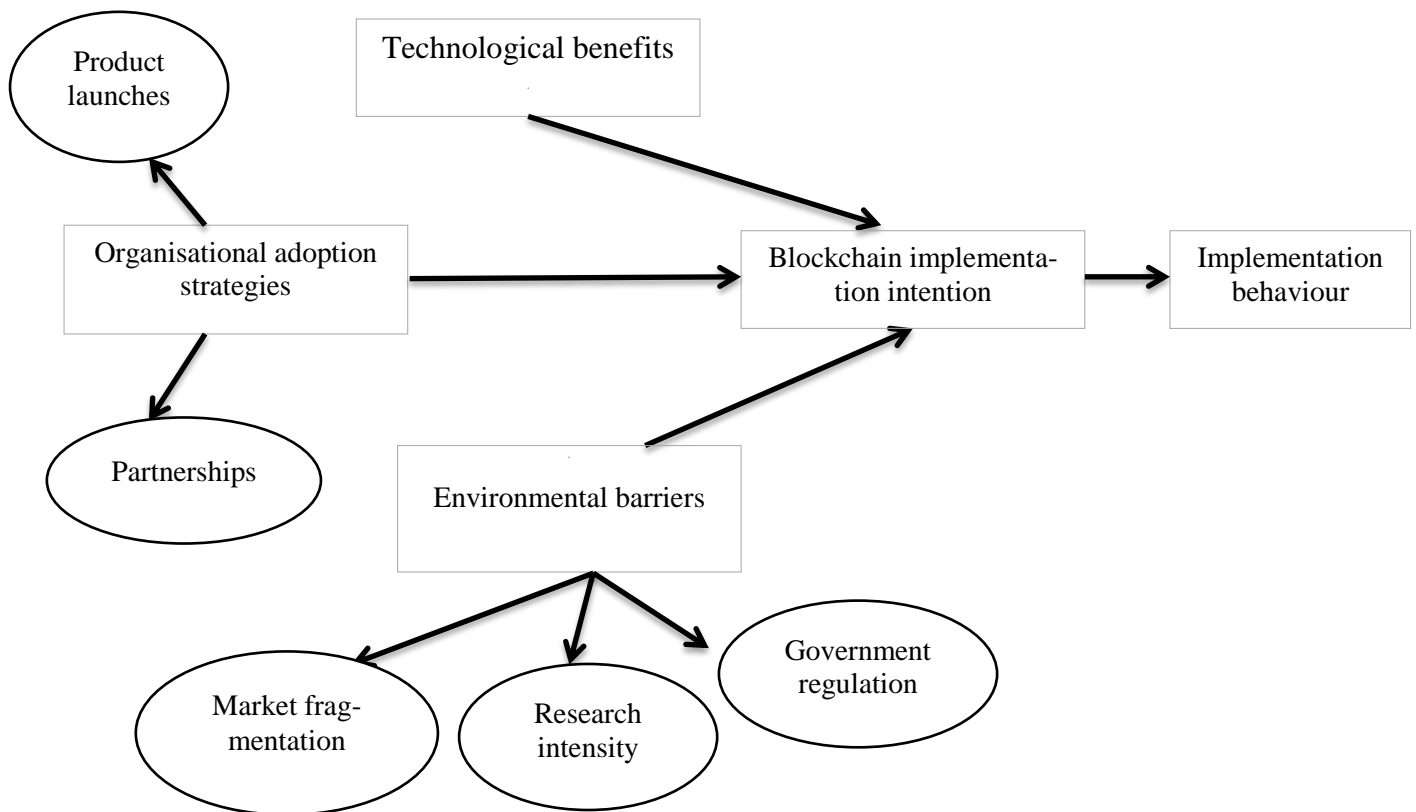
Source: Author’s elaboration

3.4.3. *Intentions to implement blockchain technology in agri-food supply chains*

In this section, we examine the themes, their underlying codes, and the relationship between each theme and implementation behaviour, resulting in the formation of three valuable propositions.

Using two theoretical frameworks, TOE and BRT, to produce a concept that enables the TOE framework to be used to root the behavioural aspects affecting the application of blockchain in supply chain management. As depicted in Figure 3.2, we propose a model that investigates the influence of technical advantages, organisational adoption strategies, and environmental barriers on the intention to use blockchain technology in agri-food supply chains.

Fig. 3.2. Thematic map of the themes as identified from available data



Source: Author’s elaboration

Both behavioural and organisational components are included in the thematic map. For example, whereas the outcome, implementation intention, is a behavioural construct, benefits, barriers, and strategies are organisational constructs. The map was constructed using the themes derived from the underlying data, as detailed later.

3.4.4 Technological benefits-blockchain implementation intention

The technological benefits of utilising blockchain technology in agri-food supply chains include improved tracking, efficient data storage, immutability, increased data access, new co-operation options, and information reliability. According to the underlying algorithms, the blockchain enables players in the agri-food supply chain to track the flow of goods across the supply chain while also supporting effective food storage. Additionally, because a blockchain-based supply chain is immutable, it enables the detection of inaccurate data, guarantee-

ing that only reliable information is saved and distributed across supply chain partners. Food-borne disease epidemics have occurred in the food industry as a result of the actions of one or more agents along the supply chain; the blockchain's provenance and traceability capabilities enable the identification of infected food crops that are unfit for consumption, which can be easily sorted out to help prevent epidemics. Additionally, the data extraction explains:

‘To counter the concerns such as food wastage, lack of provenance data, delayed payments, and unavailability of crop insurance, consumers and other supply chain stakeholders are increasingly demanding improved transparency in the agriculture and food supply chain. Blockchain technology is pitched to be the leading contender in the agriculture and food system to streamline the handling of all these concerns’(Expert commentary extracted from *Agricola*).

Managers are more receptive to incorporating blockchain technology into their supply chain when they have a firm grasp of its technical utility. This demonstrates a substantial association between the technical benefits of blockchain and managers' intentions to implement it within their operations. One of the frequently touted benefits is the technology's extensive knowledge base, which opens up new avenues for supply chain sustainability. In light of this knowledge, we propose our first proposition:

Proposition 1: The desire to implement blockchain technology in agri-food supply chains is fueled by an awareness of the technological benefits, since the knowledge held on blockchain provides stakeholders with new potential for supply chain sustainability.

3.4.5 Environmental barriers-blockchain implementation intention

Environmental concerns abound in regard to supply chain management using blockchain. These are limits placed by environmental and contextual variables, such as market fragmenta-

tion, regulatory requirements, and a general lack of blockchain testing. Government regulation of blockchain adoption is another sort of environmental constraint. Because blockchain is a relatively new technology, not all countries have the same approach. Some hesitations could occur in contexts where cryptocurrencies have been blacklisted, for example. Moreover, because blockchain is still in its infancy, additional exploratory study is required to assess its viability and adaptability to industry-specific market requirements.

In this regard, the agri-food supply chain has unique challenges, including the upstream sector's vulnerability to weather changes, the lack of standardised commodity pricing schemes for particular farm products, development threats and uncertainties, and pest and disease concerns. While blockchain, as a distributed ledger technology, has the potential to assist in overcoming those obstacles, additional research is required to fully understand how blockchain operates and how it helps in overcoming the mentioned environmental barriers. Due to a lack of information regarding the proper strategy for blockchain-supply chain integration, managers' willingness to integrate blockchain into their supply chains remains limited. On the basis of this realisation, we make the following proposition.

Proposition 2: The willingness to use blockchain in agri-food supply chains is significantly limited by environmental barriers, as the market is highly fragmented due to poor government regulation and little research, resulting in a frail industry-specific implementation framework.

3.4.6 Organisational adoption strategies-blockchain implementation intention

Two major organisational adoption strategies are identified in our study: connection building and product introduction.

Small and medium-sized firms comprise the agri-food supply chain. Due to blockchain's technological requirements, partnerships and collaborations become vital for businesses to

pool resources and conduct transactions on the blockchain. The blockchain architecture's decentralised nature, paired with its peer-to-peer operating system, enables cooperating businesses to have equal access to and control over the information transmitted. Additionally, blockchain data are immutable, which means they cannot be updated without the unanimous permission of all parties.

Additionally, product launches on the blockchain have the potential to pique managers' interest in integrating blockchain into the agri-food supply chain. Regardless of the deployment strategy, the success of blockchain implementation is dependent on supply chain partners' willingness to collaborate in a fragmented sector and apply industry-specific research-based guidelines throughout the supply chain. Constraints imposed by the environment have an effect on the link between adoption strategies and intention to implement. In summary, we propose the following based on the findings of the thematic review:

Proposition 3: The effectiveness of blockchain implementation in agri-food supply chains is driven by the supply chain entities' organisational adoption strategies, which might be influenced by environmental barriers.

3.5 Discussion

Our findings indicate that not only organisational aspects but also behavioural characteristics are critical factors to consider when implementing blockchain in supply chain management (Queiroz *et al.*, 2019). On the one hand, based on theories of technology acceptance such as Technology Acceptance Model (TAM) and UTAUT, most of the prior research (Wong *et al.*, 2020A; Queiroz *et al.*, 2020; Francisco & Swanson, 2018) established that individual behavioural dimensions such as trust, social influence, facilitating condition, performance expectancy, and technical affinity all influence blockchain adoption intention. On the other hand, research employing the TOE framework (Gokalp *et al.*, 2020; Wong *et al.*, 2020B) has

demonstrated that organisational characteristics frequently influence blockchain adoption in supply chains.

We bring these two schools of thought together through an analysis of the behavioural and organisational factors driving blockchain adoption. Although Kambel *et al.* (2019) infused behavioural (TPB) and organisational (TAM and Technology Readiness Index (TRI)) theories, our study is the first to combine BRT and TOE to provide a theoretical framework for examining the combined influence of behavioural and organisational factors on blockchain adoption. Our findings demonstrate that managers' reasoning, specifically their "reasons for" (benefits), "reasons against" (barriers), and adoption strategies, all influence blockchain implementation intention and that these three constructs are weighed against prevailing technological, environmental, and organisational conditions, respectively. To summarise, as demonstrated by our conceptual model and the three propositions that arose from this study, managers consider the technical benefits, organisational implementation strategies, and environmental implications of using blockchain to manage their supply chains.

Our findings indicate that technological advantages are critical determinants of blockchain implementation, which is consistent with recent research indicating that the perceived value of blockchain technology is a crucial deciding factor for adoption (Luthra & Mangla, 2018). When managers see the potential benefits of blockchain technology for supply chain management, incorporating it makes sense.

Additionally, we find that organisational adoption strategies are important to the successful use of blockchain technology. This is challenging prior research (Wong *et al.*, 2020B) which indicated that senior management support has no effect on blockchain implementation. A possible explanation for this discrepancy in findings is the peculiarity of the agri-food supply chain, which comprises mostly small firms (Yanes *et al.*, 2010) as collaborating enterprises

demanding cooperative implementation of a blockchain strategy. Additionally, organisational strategy has a key role in the adoption of supply chain innovation (Seman *et al.*, 2019, Dubey *et al.*, 2020).

Our findings are at the intersection of two well-established theories: BRT and TOE. Whereas BRT focuses on the individual behavioural elements that influence blockchain implementation, TOE focuses on the technical, organisational, and environmental contexts in which blockchain implementation occurs. We present a holistic view of the elements driving blockchain application in supply chain management through our findings, thereby substantiating the central assertions of BRT and TOE. As a result, we create a theoretical framework that enables an evaluation of the technical, organisational, and environmental antecedents of blockchain implementation from an individual behavioural standpoint. This conceptual framework established by thematic mapping provides a comprehensive analysis of not only environmental barriers but also other elements, such as technology benefits and organisational adoption strategies.

Previous research has examined the impact of behavioural determinants on blockchain adoption independently (Queiroz *et al.*, 2021) and concurrently (Kouhizadeh *et al.*, 2021, Gokalp *et al.*, 2020, Dubey *et al.*, 2020, Janssen *et al.*, 2020) proposed paradigms for studying the combined effect of technological, market, and institutional factors on blockchain adoption; however, behavioural aspects were mainly ignored in the concept, which was not contextualised in supply chain management. Thus, our findings bridge this divide by developing a framework for studying the individual and organisational characteristics that influence blockchain implementation in supply chain management. It has been asserted that businesses' ability to leverage people, organisational, and technological elements concurrently will go a long way towards assuring the successful implementation of blockchain technology in supply chains (Francisco & Swanson, 2018).

As a result, we theorise that blockchain adoption in supply chains is influenced by a combination of human behavioural and organisational characteristics. These occurrences are summarised in our model, which is illustrated in Figure 2 and is made of organisational and individual-level constructs. Individual constructs were obtained from codified data and are consistent with BRT (Claudy *et al.*, 2015), whereas organisational constructs were likewise produced from data and are consistent with the TOE framework's assertions (Kouhizadeh *et al.*, 2021). Thus, each of the TOE's components consolidates the three proven behavioural constructs of "intentions," "reasons for," and "reasons against". To gain 'technological benefits,' for example, two components are required: technology (as defined in TOE) and benefits (from BRT). Benefits are viewed as "reasons for," whereas barriers are interpreted as "reasons against" (Sahu, *et al.*, 2020).

Before selecting whether to deploy blockchain technology, managers should carefully analyse the technological benefits of digitalizing supply chains, such as their ability to facilitate provenance and enhance the sustainability of agri-food products (Fathollahi-Fard *et al.*, 2021C). We discover that the adoption strategies are well considered from an organisational standpoint (organisational adoption strategies), implying that the process by which an organisation becomes acquainted with blockchain technology can also influence managers' intentions to implement the technology in their supply chains, thus corroborating the findings of (Lu *et al.*, 2021) that organisational readiness promotes blockchain adoption intention. Finally, our thematic analysis reveals that the barriers to blockchain implementation are related to environmental factors, which we refer to as environmental barriers. Environmental barriers also influence blockchain implementation intention.

Additionally, managers can use behavioural factors such as potential benefits, adoption strategies, and perceived barriers to substantiate their behavioural intention to use blockchain in the supply chain's technological, organisational, and environmental elements, respectively.

More precisely, in line with previous research that has used BRT to examine human decision-making processes related to technology or innovation adoption (Claudy *et al.*, 2015, Sahu *et al.*, 2020), we define the "reasons for," and "reasons against" as potential benefits and perceived barriers, respectively, while a third construct, adoption strategies, emerges, implying that managers rationalise their intent to introduce blockchain after these three critical organisational antecedents. The dataset reveals two primary strategies for adoption: partnership formation and product introductions. This finding corroborates (Kouhizadeh *et al.*, 2021)'s argument that managers should work with other supply chain managers to guarantee successful blockchain deployment.

3.6 Conclusions

In this study, we investigate the behavioural antecedents of blockchain implementation in supply chains. In accordance with the technique provided by (Braun & Clarke, 2006) we conduct thematic analysis on agri-food media news concerning blockchain, which we previously obtained from the Agricola section of the Ovid database.

3.7.1 Theoretical contributions

Our findings have implications for both theory and practise. As a theoretical contribution, we extend the claims of BRT by offering adoption procedures as a guide to implementation intentions. This shows that the manner in which organisations become acquainted with blockchain technology may have an effect on managers' desire to implement the technology into supply chain management on a consistent basis.

Most of the extant studies on blockchain adoption were based on TAM, the principal of which is UTAUT, which fails to recognise "reasons" as significant determinants of adoption behaviour. Our study deviates from this by engaging BRT which posits that reasons are good predictors of adoption behaviour. Furthermore, existing studies have examined blockchain

implementation at the organisational level, while our study investigates the organisational and individual behavioural factors affecting blockchain acceptance.

Additionally, we supplement BRT by integrating it with TOE to create an integrated structure that enables a thorough examination of the behavioural antecedents of blockchain implementation based on managers' consideration of technical, organisational, and social factors. As a result, BRT bolsters the TOE framework by explaining the impact of behavioural aspects on the use of blockchain in supply chain management. Each of the TOE framework's three components effectively ties to the BRT's major statements, most notably the reasons for and against blockchain use, as well as supply chain management adoption strategies. Thus, we demonstrate, for the first time to our knowledge, how BRT may be utilised in conjunction with TOE to shed light on the behavioural antecedents of blockchain implementation in supply chain management. Additionally, the conceptual model, which takes into account technical advantages, organisational adoption strategies, and environmental barriers, gives managers a unique perspective on blockchain for supply chain management.

Three topics emerge as a result of the thematic analysis, from which we offer three significant contributions to the literature. First, we propose that the BRT framework complements the TOE framework by clarifying the behavioural implications of blockchain adoption in supply chain management. The second proposition is that technology advantages positively influence supply chain implementation intentions. Third, our analysis demonstrates that organisational adoption strategies are crucial for the successful implementation of blockchain in supply chains and are influenced by environmental barriers.

3.7.2 Managerial implications

Our findings also have several implications for managerial practice. First, by contextualising our study in the agri-food supply chain, we respond to calls for increased industry-specific

empirical studies on blockchain technology, which is necessary to unravel the latent factors inhibiting blockchain utilisation by managers. By identifying some of those factors in this study, we lend our contribution to the call for increased adoption of blockchain technology in agri-food supply chain management. Blockchain is critical to enhance transparency in the agri-food supply chain, just as it also increases trust and enhances collaboration among supply chain actors (Querios *et al.*, 2021). Therefore, the use of blockchain in agri-food supply chain management will help facilitate information sharing, reduce uncertainties and increase agri-food market efficiency. Another implication of increased blockchain utilisation in the agri-food supply chain is the elimination of middlemen who sometimes reap off producers' gains and whittle down the strength of the relationship between producers and consumers. Since blockchain facilitates direct buyer–seller transactions, managers can take advantage of the technology to maintain one-on-one relationships with customers and other stakeholders along the agri-food supply network.

One of the primary technological advantages of blockchain that managers should consider is its potential to give stakeholders new chances for sustainability. Managers are continually looking out for innovative ways to promote supply chain sustainability, and blockchain, as an emerging technology with its immutability, encryption, and provenance capabilities, will aid in improving supply chain sustainability management. Blockchain technology enables stakeholders to build new partnerships, eliminate intermediaries, and increase responsibility, simplifying the monitoring and evaluation of agri-business activities in the process. Consider the danger of food contamination during discussions about the importance of open agri-food supply systems. Additionally, blockchain technology is reshaping traditional business models in domains such as inventory management, procurement, and postharvest processing of agri-food products from field to market.

The three behavioural factors we have identified in this study could also provide justification for managers when considering blockchain implementation. Essentially, the effectiveness of blockchain implementation is determined in part by the organisation's adoption strategies, which are in turn influenced by environmental barriers. Supply chain managers should also consider proper implementation strategies such as product launch or partnership creation, as these have been demonstrated to improve the possibility that other partnering managers will incorporate blockchain into their supply chain. On the other hand, organisations must struggle with environmental constraints such as market segmentation, analysis, and regulatory oversight. Managers can use this information to decide the most effective way to integrate blockchain technology into their supply chain. Following a thorough assessment of their needs and objectives, as well as the unique characteristics of their supply chain, partnering managers may agree on an optimal implementation strategy for blockchain use in their supply chain. For instance, in the case of geographically dispersed small and medium-sized firms, supply chain collaborations are crucial.

3.7.3 Limitations and suggestions for further research

Our study is not without limitations, which could open spaces for further research. First, we collect data from secondary sources; future studies could consider surveys or in-depth interviews with managers to acquire additional understanding of the behavioural elements affecting blockchain implementation in supply chain management. Then, due to the nature of our dataset and in answer to our research question, we employ a qualitative method. The study, however, could benefit from complementary quantitative analysis. Additionally, the three assertions advanced in this paper could be empirically tested to aid in our understanding of the subject.

Moreover, because this analysis is exploratory in nature, future research should employ an interpretivist approach that allows for the validation of hypotheses and the production of pertinent deductions. Finally, while we focused on the agri-food supply chain, it would be fascinating to investigate the antecedents to blockchain implementation in other industries, such as health or fashion.

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Chapter 4

Communicating responsible management and the role of blockchain technology: Social media analytics for the luxury fashion supply chain³

4.1 Abstract

Purpose- To communicate their sustainability and responsible management practices to the public, firms can leverage digital technologies both at the organisational and managerial levels. This study explores how firms' communications of responsible management contribute to sustainability in supply chains, as well as the role of blockchain in promoting responsible management.

Design methodology- Employing a qualitative methodology, we perform social media analytics (content analysis and sentiment analysis) on a dataset obtained from the social media posts of managers.

Findings- The study identifies eight key responsible management practices and shed new light on the role of blockchain in responsible management. Our results contribute to theory by linking responsible management practices with existing sustainability practices in the supply chain. We also demonstrate that blockchain enhances responsible management.

Research limitations/implications- Reliance on publicly available data from social media, comprising corporate statements emanating from managers is a major limitation in this study.

Practical implications- The eight responsible management practices identified in this study are recommended for managers of different supply chain echelons to promote Sustainable Supply Chain Management (SSCM). Our findings also offer new rationale for blockchain adoption in supply chains.

³ Please be informed that similar version of this chapter (with the same title) has been published in *Total Quality Management journal*, ISSN 1754-2731 (2022). Special thanks to my co-authors, Prof. Nadia Di Paola and Prof. Roberto Vona for their assistance. However, I take responsibility for any error observed within the chapter.

Originality/value- To the best of our knowledge, this is the first study to link the concepts of responsible management and SSCM. Moreover, we obtain empirical evidence from managers in the luxury fashion supply chain.

4.2 Keywords- Blockchain; luxury fashion supply chain; responsible management; social media analytics; sustainability.

4.3 Introduction

The supply chain involves the interconnectivity of various organisational players and activities for the transformation of raw materials into finished products or services as well as the movement of goods from suppliers to final consumers, which reduces the visibility and reliability of the network (Di Paola, 2018; Ruta *et al.*, 2017). The globalisation of businesses coupled with the proliferation of actors has heightened the risk of information asymmetry and unsustainable practices in the supply chain (Koksal *et al.*, 2017). As a result of the opacity and reduced transparency among the network of actors combined with the indiscriminate pursuit of competitive advantage by one or more entities of the supply chain to win more customers and gain more value, there is a risk of ignoring sustainability concerns in business operations. Moreover, the communications that emanate from firms are sometimes different from their actual practices. However, the adverse effects of unsustainable practices could be costly for supply chain actors as the unethical conduct of one stakeholder not only affects the erring organisation but also has a contagion effect on other firms operating in the supply chain network (Gong *et al.*, 2019).

The increased attention from potential and existing customers also mounts growing pressure on businesses to improve their sustainability and social responsibility (Saha, *et al.*, 2020; Mishra & Schmidt, 2018). Social responsibility and environmental sustainability are therefore non-negotiable for firms as individual corporate entities and, more importantly, as part of a

supply chain network. It is imperative to keep the supply chain in focus while pursuing sustainability objectives since the action of one firm affects other partnering firms. To be a socially responsible corporate entity and to keep the supply chain sustainable, firms should therefore build socioecological resilience by giving adequate consideration to environmental sustainability and ethical standards, particularly with regard to the individual actions of their stakeholders and those of their supply chain partners (D'Eusanio *et al.*, 2019).

Ideally, organisations in the same supply chain network depend on one another for sustainability as the value created by one is also enjoyed by all the partners (D'Eusanio *et al.*, 2019), both tangibly in the form of financial improvement and intangibly in terms of goodwill and social responsibility. It is thus necessary for organisations to monitor their responsibility and ethical conduct as well as those of the other firms in their supply chain. This is particularly true of the luxury fashion industry, in which traceability and end-to-end visibility are crucial (Karaosman *et al.*, 2020). However, given the inadequacies of the conventional traditional supply chain management system, it has been asserted that organisations pursue sustainability objectives at the corporate level merely to boost brand image and improve stakeholders' perception of their legitimacy (Maloni *et al.*, 2021). Thus, a conceptual shift is necessary from the pursuit of sustainability at the organisational level to the individual level involving relevant stakeholders (Freudenreich *et al.*, 2020). The basic idea is that when attention is devoted to the individual approach of achieving sustainability, it is possible to go beyond opportunistic discourse as managers' integrity is at stake when communication is made personally. Moreover, most firms have realised that managers and individual employees are important to the successful implementation of corporate responsibility and sustainability objectives (Carroll & Laasch, 2020), thus birthing a conceptual shift in the discussion of responsibility from the organisational level to the managerial level. In light of this, our intent is to lend empirical evidence to the core arguments of responsible management and to establish that there are

overarching commonalities, both in context and in practice, between SSCM and responsible management. More explicitly, the primary purpose and central focus of this study is to provide concrete empirical evidence on what constitutes responsible management as publicly discussed by managers on their social media pages and how it influences supply chain sustainability using the textile industry as a reference. In this way, we make a case for an individual managerial perspective on SSCM in lieu of the traditional corporate approach.

Responsible management is an emerging concept that involves the integration of sustainability, responsibility, and ethics (SRE) into managerial practices (Laasch, 2018). The core ideas portrayed in the various definitions of responsible management are closely related to those of Corporate Social Responsibility (CSR) (Nonet *et al.*, 2016); in fact, Laasch & Gherardi (2019) conceptualise responsible management as what managers do or are expected to do to help the organisation achieve its CSR goals since business actors have varying perceptions of environmental, social and economic values (Oskam *et al.*, 2021). Responsible management is, however, distinct from CSR and associated constructs in that responsible management focuses on individual managers and not the entire corporate entity (Hilliard 2013). It emphasises managerial practices outside the academic setting, and it particularly analyses the ability of regular managers, not just professionals such as CSR managers or ethics officers, to lead responsibly (Suddaby & Laasch, 2020).

Notwithstanding their actual practices, it is important that managers create necessary awareness by communicating their responsible conduct on digital technologies such as social media, which involve increased patronage and wider reach of audiences, as customers in this era pay more attention to social media platforms. Firms have recorded varying degrees of success based on their ability to communicate their responsible management practices to stakeholders on social media (Laasch & Conaway, 2017), especially when firms use images and videos, which tend to stimulate purchasing intention and increase stakeholders' CSR participation in-

tention (Chung & Lee, 2019), just as social media is also useful for managing organisational crises (Jin *et al.*, 2014). In addition, it is equally important that individual managers publicise their responsible conduct as this informs stakeholders of the extent to which the firm is committed to the pursuit of sustainability. Hence, this study focuses on communication about responsible management and its influence on sustainability. We reason that when managers publicise their responsible management practices, stakeholders are better informed of the firm's effort to improve society; in turn, firms can also obtain feedback regarding the impact of their business processes on people's welfare, thereby increasing trust and strengthening relational ties while enhancing social sustainability in the long run.

The advent of digital technology, especially blockchain, has had a considerable influence on the practice and communication of responsible management. Blockchain is a disruptive innovation that can also be used to enhance responsible management practices. We conjecture that the use of blockchain technology should be increasingly integrated into supply chain processes and that this should transcend communication or marketing purposes to determine the pursuit of responsibility and sustainability objectives. However, essential considerations should be made before deciding to engage blockchain in supply chain management as the information varies according to the type of blockchain used, while the veracity of its content depends on the integrity of the company feeding data into the blockchain.

Studies have shown that blockchain is a distributed technology that contributes to the achievement of sustainability objectives with reference to reducing carbon emissions (Wang *et al.*, 2020) and aiding environmental impact assessment (Kshetri, 2021). In addition, we maintain that blockchain is fundamentally an information technology that managers can leverage to inform customers and stakeholders about their responsible conduct. Thus, we also seek to explore the influence of blockchain usage on responsible management. Motivated by these considerations, we raise the following research questions:

RQ1: How does the communication of responsible management influence sustainable supply chain management?

RQ2: How does blockchain technology usage contribute to responsible management?

To answer our research questions, we employ the technique of social media analytics (Suseno *et al.*, 2018; Stieglitz *et al.*, 2014; 2018), particularly content analysis and sentiment analysis, on data collected from the individual Twitter pages of managers in the luxury fashion supply chain. Thus, we contribute to the literature on SSCM and responsible management in three significant ways. First, we identify eight key responsible management practices communicated by managers of luxury fashion brands. Second, we establish responsible management as an antecedent of sustainability in the supply chain. Third, we empirically illustrate how managers' perception of blockchain enhances responsible management.

Having introduced the study in this section, the remaining part of this paper is structured as follows. Section two provides the theoretical background on responsible management and SSCM; section three explicates the research method employed; section four presents the results of the empirical analysis; and section five discusses the results and illustrates the practical implications of our study as well as offering suggestions for further research and the limitations.

4.4 Theoretical background

A review of previous studies on responsible management and SSCM reveals that the constructs have been individually explored by several authors. The review of both constructs independently is able to set a pace for their integration in our study. To this end, first, we provide the origin of responsible management and its associated concepts, and then we review the issues surrounding the communication of responsible management on social media. We further present SSCM with respect to its drivers and consequences and distinguish it from re-

lated constructs such as green supply chain management. Finally, in this section, we review the role of blockchain in SSCM.

4.4.1 *Responsible management: Origin and related concepts*

While discussions about the need to educate managers on environmental sustainability, social responsibility and ethics began in the early 2000s, responsible management did not emerge as a concept until 2007 in the United Nations Principle of Responsible Management Education (Laasch & Moosmayer, 2015). It was initially called responsible management education, an academic concept taught in business schools, before the development of responsible management as a practice-based construct. Although a convergent and universally acceptable definition of responsible management is still lacking in both the literature and the United Nations' Principles of Responsible Management Education (Nonet *et al.*, 2016), several authors have defined the concept from different perspectives. For instance, responsible management, according to Laasch & Gherardi (2019), is managerial practitioners' practices of managing responsibly by deeply embedding sustainability, responsibility, and ethics into every manager's work. At the intersection of business and society lies the concept of responsible management, which refers to the strategies, actions, and tactics that managers should undertake to help an organisation achieve its corporate social responsibility (Carroll *et al.*, 2020).

For a long time, academic research on the concepts of responsibility, sustainability and ethics has centred on the organisation as the unit of analysis. However, responsible management deviates from this by focusing on individual managers instead. Corporate responsibility and responsible management have been individually explored in the literature about their antecedents and consequences. A responsible firm increases customer trust and improves stakeholder relationships, while an irresponsible firm decreases social capital, especially trust. From the individual perspective, some of the precursors of irresponsible behaviour by managers have been identified to include the undue pursuit of capitalism accompanied by negli-

gence of social impact to the detriment of society (Riera & Iborra, 2017), which is why conscious capitalism is advocated for business leadership (Frémeaux & Michelson 2017). Additionally, the vagueness characterising managerial responsibility is expounded by instrumentalism theory, in which the concept of responsibility is sometimes taken as a cliché rather than a practice in reality (Arend, 2014). Furthermore, differences exist in individual perceptions of what is right or wrong based on subjective norms.

Laasch (2018) distinguished the concept of responsible management from related fields such as corporate social responsibility and business ethics in terms of analytical scope by asserting that responsible management focuses on individual managers (not firms), managerial (not academic) practices and normal managers (not specialists such as CSR managers). Since the proponents of responsible management emphasise individual managers as the unit of analysis, certain empirical investigations of responsible management have been conducted using business school students, who constitute potential managers. For instance, Nonet *et al.* (2016) tested business school students' understanding of responsible management during their graduate programmes and identified being mindful, inspiring, caring, and ethical as the essential qualities of responsible managers. In a similar vein, Hibbert & Cunliffe (2015) explored responsible management within the context of business school students and found that learning about academic principles is not sufficient to make managers responsible; instead, reflexivity is key to helping managers develop responsible management practices.

The major focus of responsible management is its sustainability component (Laasch & Gherardi, 2019), which can be effectively addressed when it is jointly pursued by all the stakeholders involved (Nonet *et al.*, 2016).

4.4.2 Using social media to promote responsible management

Social media has become an interesting source of information for supply chain studies due to its unique ability to reveal contemporary events in real time (Janjua *et al.*, 2021) and the opportunity to derive relevant intuitions from a large volume of virtually generated data based on users' content (Chatterjee *et al.*, 2018).

Compared to publications on other platforms such as companies' websites, social media provides a wider reach of audiences while also facilitating bilateral communication (Chu *et al.*, 2020) in which managers can communicate their responsible conduct and obtain reactions from the public. Through social media, stakeholder awareness can be improved and doubts can be managed (Lee *et al.*, 2013). A benefit of using social media for communicating a firm's responsibility is that people do not need the company's consent to share their opinions, thus giving firms the opportunity to receive honest feedback from customers and other stakeholders regarding their responsible conduct (Cho *et al.*, 2017).

Among the common social media platforms on which firms communicate information about their responsible behaviour, Twitter is the most widely used, followed by YouTube, Facebook and LinkedIn, in that order (Yang *et al.*, 2020). While the primary rationales for utilising Facebook and LinkedIn have been identified as self-representation and professional advancement, respectively, Twitter is recognised as a platform for information dissemination and opinion sharing (Grover *et al.*, 2019B) and is suitable for analysing communications on sustainability (Reilly & Larya, 2018).

Based on its veracity, information on social media can be classified as either fact or individual opinion, which often poses challenges to social media analytics. To address this issue, an algorithm was developed by Chatterjee *et al.* (2018) to separate facts from sentiments, thus further improving the social media analytics process. Another challenge of social media data

is how to ensure the representativeness of the user population. In response to this issue, Hino & Fahey (2019) proposed a methodological alternative to application programming interfaces (API) by leveraging cloud services, which yielded a more representative dataset.

4.4.3 *Sustainable supply chain management: Drivers, consequences, and related fields*

Broadly, sustainability refers to the creation of social value for the present generation without undermining the chances of future generations enjoying the same. With regard to supply chain management, sustainability involves the voluntary integration of social, economic and environmental precepts into interorganisational business systems by companies in the same supply chain network to manage information, material and capital flow associated with the procurement, production and distribution of goods and services to enhance profitability and competitiveness (Dubey *et al.*, 2017). D'Eusanio *et al.* (2019) argue that sustainability simply involves processes and socioeconomic conditions, such as the safety and welfare of the people in the supply chain.

Several definitions of sustainable supply chain management have been offered in the literature. SSCM is the creation of harmonised supply chains through voluntary incorporation with the main intersystems of firms to encourage efficient and effective management among the resources, information and capital flow associated with the acquisition, manufacture and distribution of products or services to meet stakeholder requirements and achieve firm benefits, competitiveness and resilience over the short and long term (Tseng, *et al.*, 2019). Dubey *et al.* (2017) define SSCM as the management of materials, information and capital flow as well as cooperation among firms in the supply chain by paying attention to the triple bottom line of environmental, social and economic goals towards the integration of stakeholder and shareholder interests. Formentini & Taticchi (2016, pp. 1921) consider SSCM “the creation of coordinated supply chains through the voluntary integration of economic, environmental, and social considerations with key inter-organisational business systems designed to efficiently

and effectively manage the material, information, and capital flow associated with the procurement, production, and distribution of products or services in order to meet stakeholder requirements and improve the profitability, competitiveness, and resilience of the organisation over the short- and long-term". An overarching observation in the various definitions of SSCM is the emphasis on the incorporation of the triple bottom line, environmental, social and economic goals, into business decisions (Hou *et al.*, 2019), the consideration of which is often motivated by certain factors that are antecedents of SSCM. Basically, SSCM is rooted in sustainable development theory, which describes the kind of development that meets the needs of the present generation without limiting the chances of the future generation in meeting their needs (Mardani *et al.*, 2020).

Research on sustainability within the field of supply chain management has evolved from identifying the antecedents of SSCM (Andalib & Soltanmohammadi 2019; Diabat *et al.*, 2014; Dubey *et al.*, 2017; Walker *et al.*, 2008) to establishing suitable methodologies for SSCM research (Mardani *et al.*, 2020; Dubey *et al.*, 2017; Formentini & Taticchi, 2016) and for the pragmatic evaluation of firm sustainability (D'Eusanio *et al.*, 2019), reviews of existing literature on SSCM (Koksal *et al.*, 2017; Walker *et al.*, 2012), the implications of sustainable practices in supply chain management (Paulraj *et al.*, 2017), the establishment of indicators of SSCM (Khan *et al.*, 2020) and barriers to blockchain adoption in SSCM (Saber *et al.*, 2019).

With regard to fashion supply chains, studies have attempted to examine the contextual factors that affect SSCM (Karaosman *et al.*, 2020) and how firms in a supply chain collaborate with one another to enhance transparency (Brun *et al.*, 2020). Despite these studies on SSCM and although the issue of sustainability is considered at various levels of decision-making processes in businesses, it has not yet received sufficient attention in the management literature (D'Eusanio *et al.*, 2019), and only limited studies have considered sustainability

across multiple tiers of suppliers in luxury fashion supply chains (Karaosman *et al.*, 2020). Moreover, the majority of past studies on SSCM have adopted organisations as the unit of analysis, while only a few have been conducted at the individual level (Mardani *et al.*, 2020). More importantly, an integrative approach to SSCM and responsible management is lacking in the supply chain literature. To fill this gap, we advance the idea of responsible management-SSCM integration, focusing on the distinct practices of mainstream managers in the supply chain.

The drivers of SSCM include pressure from customers, pressure from the government, pressure from stakeholders (Seuring *et al.*, 2019), public awareness (Gong *et al.*, 2019), strategic supplier collaboration, green warehousing, economic stability, logistic optimisation, social value and ethics, and enabling information technologies (Dubey *et al.*, 2017). These drivers could be a result of external or internal features of firms operating in supply chains as the overall sustainability of the network is dependent on the connection among the supply chain components. In fact, the greater the extent to which firms rely on supply chain partners, the greater the extent to which their environmental and social sustainability depends on their supply chain partners (Gong *et al.*, 2019).

One construct that is often used interchangeably with SSCM is green supply chain management, which is an important branch of SSCM that describes the innovation of incorporating environmental concerns into supply chain management processes such as product design, material sourcing, the manufacturing process, delivery to final consumers and the end-of-life management of the product (Mardani *et al.*, 2020; Hou *et al.*, 2019).

Strategies for maintaining the sustainability of businesses and supply chains have been extensively explored at the corporate level. To ensure improved performance, it is necessary for the implementation of firm sustainability strategies to align with the overall sustainability of

the entire supply network (Formentini & Taticchi 2016). Firms must equally pay adequate attention to the triple bottom line—the environmental, social and economic goals of sustainability (Tseng *et al.*, 2019; Hong *et al.*, 2018)—as well as culture and governance mechanisms (Babu and Mohan 2018). In addition, when designing and implementing sustainability strategies, a firm must consider all its stakeholders, including the base of pyramid (BoP), which represents the socially poor, such as local suppliers (Seuring *et al.*, 2019). Attention should also be given to the general public with an effort to develop the capability of weak supply chain partners (Khalid *et al.*, 2015). This is because the ability of the focal firm to effectively communicate its sustainability practices to the public, especially customers, is an important driver of the firm's own sustainability as well as the overall sustainability of the supply chain (Gong *et al.*, 2019). To communicate their sustainability practices to the public, firms can leverage digital technologies (Huang *et al.*, 2020) at both the organisational and the managerial level. However, the literature has yet to explore the development of sustainability from the firm's internal individual factors, particularly the responsible management practices of managers and the role of digital technology in this development.

4.4.4. The role of blockchain in responsible management and SSCM

Supply chains are multifaceted and involve different segments and actors that are geographically dispersed across industries, thus creating complexities with respect to management and control (Saber *et al.*, 2019; Vona & Di Paola 2018). The complexity of global supply chains in terms of structure and processes poses serious threats to the achievement of sustainability in the chain through reduced traceability, security and visibility (Koberg & Longoni, 2019). Sauer & Seuring (2019) investigated sustainability issues in the upstream and downstream segments of a multitier global sustainable supply chain and identified issues regarding product traceability and environmental degradation. Moreover, the distance between buyers and suppliers operating in a global supply chain inhibits managers from seeing beyond the first

tier of suppliers (Koberg and Longoni, 2019). Hence, there is a need for a sophisticated information technology that not only improves product visibility but also ensures data security as well as the overall sustainability of the supply chain.

Blockchain, a technological innovation that has facilitated disruptions in the conduct of business transactions, is essentially a distributed database system that maintains records of transactional data or other information, secured by cryptography and administered through a consensus mechanism (Swan, 2015). The technology was built in 2008 by an anonymous person or group of persons named Satoshi Nakamoto and consists of a data structure that combines data records, referred to as blocks, within a network of actors called chains (Cole *et al.*, 2019). Blockchain technology differs from most existing information system designs in its four main features, which make it essential in supply chain management. First, it is distributed and synchronised across a network of actors, which enables the sharing of data and common information by the multiple organisations in the supply chain (Wang *et al.*, 2019). Second, in its smart execution, the terms of agreement among partners are written in digital nodes known as smart contracts, thus eliminating the need for third parties when sealing transactions (Saber *et al.*, 2019). Third, control is decentralised as the networks are connected in a peer-to-peer system (Wang *et al.*, 2019) in which there must be universal agreement among partners before a transaction can be validated. Fourth, blockchain is secure and immutable in that once transactions are recorded and sealed, no entity has the power to unilaterally influence the transaction without the consent of the other partners in the chain (Cole *et al.*, 2019; Wang *et al.*, 2019).

Research on blockchain-supply chain management integration is not a novel idea. Some studies have provided a broad overview of blockchain in supply chain management (Saber *et al.*, 2019; Wang *et al.*, 2019). Others have presented the technicalities and other challenges in its operationalisation (Kumar *et al.*, 2020; Kouhizadeh *et al.*, 2020), while some have illustrated

the implications of blockchain on cost reduction, carbon emission, quality, risk mitigation and other performance objectives of supply chain management (Manupati *et al.*, 2020; Cole *et al.*, 2019; Kshetri, 2018). However, the way that blockchain aids the ability of managers to manage responsibly has not been sufficiently investigated in the literature.

In summary, the main constructs we employ in our analysis include responsible management, digital technology and SSCM. Table 4.1 presents the definitions of these constructs.

Table 4.1. Constructs

S/N	Constructs	Definitions	References
1	Responsible management	The integration of Sustainability, Responsibility and Ethics (SRE) into the managerial practices of normal managers. It involves the development of formal knowledge and critical thinking, with a broad holistic, triple-bottom line understanding of management, thereby creating value for all stakeholders. It is embedded in phrases such as: Moral reflexive practice; seeing issues from new perspectives; being inspiring and caring; managing responsibly and ethically; challenging the irresponsibility in management practices.	Laasch, 2018; Hibbert & Cunliffe 2015; Suddaby & Laasch 2020; Nonet <i>et al.</i> , 2016.
2	Digital technology	Electronic system or device that can generate, store or process data. Examples include blockchain, cloud, Internet of Things, social media.	Ivanov, <i>et al.</i> , 2019; Saberi, <i>et al.</i> , 2019
3	Sustainable Supply Chain Management	The management of materials, information, and capital flow as well as cooperation among firms in the supply chain paying at-	Dubey, <i>et al.</i> , 2017 ; Diabat <i>et al.</i> , 2014; Walker <i>et al.</i> , 2008; Formentini & Taticchi, 2016..

		<p>tention to the tripple bottom line of environmental, social and economic goals, towards an integration of stakeholder and shareholder interests. It includes environmental conservation, social values and ethics and strategic collaborations.</p>	
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4.5 Method

4.5.1 Social media analytics

To investigate how communicating responsible management practices could be integrated with SSCM and the role of digital technology as an antecedent of responsible management, our study relies on a qualitative methodology, which is appropriate when little is known about a subject of enquiry as it allows for the exploration of unclear problems towards the generation of testable hypotheses (Nonet *et al.*, 2016).

The increased use of digital technologies coupled with the deluge of internet-based communications on social media platforms has revolutionised the way firms present their brands and convey corporate information to stakeholders and the general public (Robmann *et al.*, 2018). Supply chain firms engage in three types of information exchange on social media: company-public, interorganisational and intraorganisational (Huang *et al.*, 2020). Company-public information exchange can be accomplished through the official social media account of the company, just as stakeholders such as employees, managers and customers can also take advantage of their individual account profiles to communicate their activities or opinions about important topics concerning the organisation. Indeed, the adoption of social media by firms creates avenues for information sharing and knowledge creation among supply chain partners (Lam *et al.* 2016).

Among the available social media platforms, we chose Twitter for this study on the premise

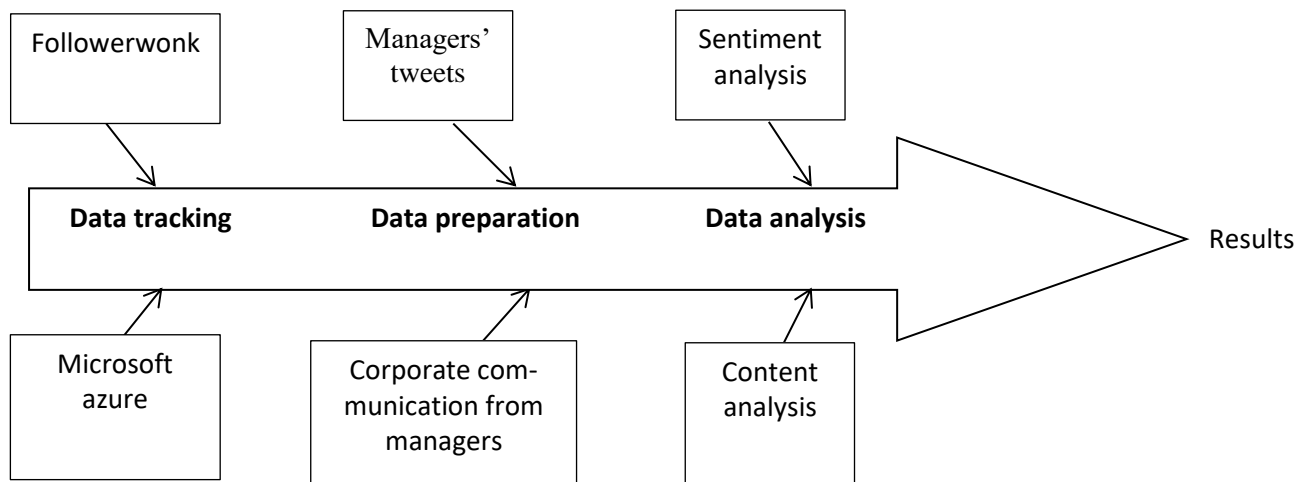
that Twitter has a strong influence on business activities and serves as a platform for stakeholders to participate in the creation of firm reputation (Grover *et al.*, 2019A). Moreover, organisations often encourage their employees to communicate their ethical practices on Twitter to improve brand reputation and stakeholder engagement (Stohl *et al.*, 2017). Although there are official tweets from companies, many messages on Twitter are individual conversations rather than corporate tweets (Reilly & Larya, 2018), thus aligning with our focus on individual managers rather than organisations as the unit of analysis.

Data sourcing from Twitter has gained popularity in the management literature over the years as it presents opportunities to derive meaningful insights from unstructured datasets. For instance, Twitter data have been employed to evaluate consumers' reactions on social media to the launch of new products (Lipizzi *et al.*, 2015), assess supply chain risks (Janjua *et al.*, 2021) and evaluate the challenges and coping strategies of supply chain firms during the COVID-19 pandemic (Sharma *et al.*, 2020).

Social media such as Twitter not only provide firms with digital platforms where dynamic data and organisational activities are publicized but also afford individual stakeholders the ability to display personal opinions and discuss salient issues (Kaul *et al.*, 2015), which can be evaluated to track the performance, trends, and social, economic and environmental impacts of business decisions (Antretter, *et al.*, 2018; George *et al.*, 2014). Hence, social media has become an important research tool in academia and industry (Huang *et al.*, 2020). One tweet from a trusted source can cause chain reactions in the press, social networks, and the stock market (Antretter *et al.*, 2018). Big data from Twitter and other social media are used to inform the public about social activities and events and to obtain knowledge to make relevant decisions (Bonds-Raacke & Raacke 2010). Moreover, big data support operational processes and enhance competitive advantage (Tseng *et al.*, 2019).

We perform social media analytics (Stieglitz *et al.*, 2014) on the data collected. This involves a sequence of three steps: data tracking, data preparation and data analysis as illustrated in Fig 4.1.

Fig 4.1. The Social Media Analytical process



Source: Adapted from Stieglitz *et al.*, (2018)

Social media analytics (SMA) is a prominent methodology that originated in the field of information systems (He *et al.*, 2013). It has been defined as an emerging interdisciplinary research field that seeks to combine, extend and adapt methods for social media data (Suseno *et al.*, 2018; Stieglitz *et al.*, 2018; Zeng *et al.*, 2010). SMA has enjoyed good application in business venturing (Antretter *et al.*, 2018) and supply chain management research (Orji *et al.*, 2020; Tiwari *et al.*, 2018; Chae, 2015) to evaluate performance, value creation, market trends and customer purchasing patterns. Blasi *et al.* (2020) also applied SMA (particularly sentiment analysis) to fashion data mined from Twitter to determine consumers' perception of the eco-friendliness of some fashion brands, while Singh *et al.* (2018) employed Twitter data analysis to analyse the idiosyncrasies of beef and steak supply chains.

4.5.2. Data collection and measures

Sustainability and responsibility are essential in industries such as luxury fashion, where the

supply chains are characterised by globalised sourcing and distribution with attendant risks and uncertainties (Cole *et al.*, 2019; Turker & Altuntas, 2014). Therefore, to answer our research questions, we obtained empirical data from the fashion supply chain, predominantly the social media pages of firm managers.

The choice of the Italian luxury fashion industry for our empirical context is justified by the relevance of this industry in Italy, which has been branded a fashion nation based on the prominence of “Made in Italy” across the globe as engendered by historical facts and cultural antecedents (Pinchera & Rinallo, 2020). Moreover, the importance of sustainability practices in this industry cannot be overemphasised as the high pace of globalisation in the fashion industry compels companies to design effective strategies to maintain a stable relationship with external stakeholders (Da Giau *et al.*, 2019). In addition, the fashion industry constitutes a productive sector of vast relevance to the Italian economy (Lenzo *et al.*, 2017) and can be considered symbolic of the country’s manufacturing excellence (MiSE, 2019). For instance, the entire industry declared a turnover of 71.7 billion euros in 2018, of which the clothing sector accounted for the largest proportion, 42.6% (Fortune Italia, 2020). However, with the increasing market share occasioned by the proliferation of textile products and the growing customer preference for Italian brands, issues of an elongated operating cycle, time mismanagement, counterfeiting, and other irresponsible behaviour by actors along the supply chain arose (Lenzo *et al.*, 2017; Vona, 2004). The Italian Ministry of Economic Development in collaboration with IBM and textile firms launched a pilot project on “blockchain for the traceability of made in Italy” to protect the origin, quality and sustainability of Italian fashion brands.

Data collection was based upon corporate communications and posts published on social media (Twitter, in particular) pages of the management of the selected companies and took place for six months, March-August 2020. The selection of managers was based on the criteria that

they had affiliations with companies in the fashion industry and that the content of their Twitter profiles focused on sustainability, fashion ethics or fashion technology. Altogether, a total of 85 managers were monitored across the different echelons of the luxury fashion supply chain.

Following the approach of Suseno *et al.* (2018) and in concordance with our research questions, which aimed to explore the contribution of responsible management to SSCM as well as the role of blockchain technology (Ivanov, *et al.*, 2019; Saberi, *et al.*, 2019) in responsible management, we utilised the application programming interface (API) for data tracking through two platforms, “Microsoft azure” and “followerwonk”, from which we obtained corporate communications and the tweets of managers using the following keywords at different intervals: “sustainability, fashion, blockchain”; “fashion, ethics”; “fashion, blockchain”; and “responsibility, fashion, blockchain”.

The second phase in social media analytics, data preparation, was conducted by cleaning the data collected, keeping in mind our research questions and the general objective of this study. In this process, we excluded tweets that were from the Twitter handles of companies rather than individual managers since we aimed to base our analysis on individual managers and not corporate entities. All corporate communications emanating directly from organisations were discarded, and we extracted quotes that were ascribed to individual managers. We were left with 108 relevant posts comprising profile updates and comments originating from a total of 85 tracked managers.

For the third phase of SMA, data analysis, we imputed the 108 posts in NVivo 12. In line with our first research question, we performed content analysis on the dataset. We began by reviewing the Twitter profiles and posts of the managers to segment their companies into the different positions of the supply chain, as previously identified from the literature: supplier,

manufacturer, distributor, wholesaler, retailer and end-user (Sabeti, *et al.*, 2019). The Twitter account details and personal profiles of managers on their official company websites were reviewed to identify their position in the supply chain.

After defining the supply chain segments, we proceeded to identify responsible management practices in the luxury fashion supply chain. We did this by running a query on NVivo to obtain the most frequently used words across our dataset and reviewing the dataset repeatedly to analyse its content. We then coded the practices of managers, keeping in mind the basic tenets of responsible management as defined in Table 1. Thereafter, we aggregated some nodes by collapsing related practices. A total of eight responsible management practices emerged after this process.

After identifying the responsible management practices of managers along the luxury fashion supply chain, we explored the integration of SSCM into responsible management within the luxury fashion supply chain. To achieve this, we leveraged the dimensions of sustainability previously identified from the supply chain management literature, which include environmental conservation, strategic collaborations, social values, and ethics (Dubey *et al.*, 2017). Each of the responsible management practices was again thoroughly reviewed in line with the content from which they were coded to establish which sustainability dimension was embedded in each of the practices.

To achieve our second objective of exploring the role of blockchain in responsible management, first, we selected content that addressed blockchain and managerial responsibility from the dataset. Our criterion for selection was that the posts contained the word “blockchain” and were related to managerial practices in the luxury fashion supply chain. We were left with posts containing various sentences attributable to 79 managers in total. Using NVivo autocoding of the sentences, we proceeded to perform sentiment analysis (Saura *et al.*, 2019;

Blasi *et al.*, 2020), which represents managers’ opinions regarding the role of blockchain in their managerial practices and processes within the luxury fashion supply chain.

4.6. Results

4.6.1 Responsible management practices

Empirical analysis of the social media posts and corporate communication of managers to determine what constitutes responsible management revealed eight key responsible management practices in the luxury fashion supply chain: preventing greenwashing, employee empowerment, consumer sensitisation, promoting green living, managing business processes with blockchain, taking responsibility for one’s actions, moral reflexivity and swift response to new challenges. Table 4.2 summarises the supply chain segments in which the managers included in this study were employed, their responsible management practices, descriptions of the practices and data extracts.

Table 4.2. Supply chain segments, responsible management practices, description, and data extract

Supply chain segments	Responsible management practices	Description	Data extracts
Manufacturer	Preventing greenwashing	Content relating to preventing greenwashing.	‘My personal view is very heavily around the need for legislation and regulation in this space, especially at a time when it’s becoming all the more “on-trend” to reference sustainability as a brand, thus making greenwashing ever more of a reality when it’s done with that in mind’.

	Taking responsibility for one's actions	Content relating to taking responsibility for one's action	'What the industry needs (more than blockchain) are factors that will force upon them the desire for transparency and the need to take responsibility for their actions in production.'
	Swift response to new challenges	Content relating to swift response to new challenges	'We're in a world where things change very quickly. Sometimes we have to set up a new warehouse in a couple of days or engage with a new vendor in a country where we've never operated.'
	Managing business processes with blockchain	Contents relating to managing business processes with blockchain.	'We believe fashion brands should use blockchain technology and fully disclose all the processes; including wages and the list of chemicals used to make our clothes.'
Retailer	Employee empowerment	Content relating to employee empowerment	'...We partner with organisations that pay fair wages. We believe in social responsibility.'
	Consumer sensitization	Content relating to cus-	'Mission: Creating a more

		customer sensitization	responsible ecosystem for the fashion industry by educating and mobilizing consumers to be positive advocates’.
Supplier	Promoting green living	Content relating to promoting green living	‘I want to highlight how some brands are not only trying to use #sustainable and #recycledmaterials on their products, they're also trying to reduce their #carbonfootprint on every step on their supply chain, e.g carbon-neutral transportation methods’
Distributor	Moral reflexivity (Hibbert & Cunliffe 2015)	Content relating to avoiding problems of the past	Our goal was always to first maximize security, avoiding the problems of our past.

Source: Author’s compilation

4.6.2 Integrating responsible management and SSCM

We integrated these key responsible management practices with extant sustainability practices in the supply chain (Dubey *et al.*, 2017; Erikson *et al.*, 2015). The results are presented in Table 4.3. As shown in the table, we related the responsible management practices from our empirical findings to existing sustainability practices from the literature following the approach of Suseno *et al.* (2018). The relationship was subsequently explicated using the data example from which the responsible management practices were previously identified.

Table 4.3. Managers' segments on the supply chain, sustainability and responsible management practices

Supply chain segments	Sustainability practices (Dubey <i>et al.</i> , 2017; Erikson <i>et al.</i> , 2015)	Responsible management practices	Share
Manufacturer	Social value and ethics	Preventing greenwashing	2.91%
		Taking responsibility for one's actions.	0.73%
		Swift response to new challenges.	0.74%
		Managing business processes with blockchain	0.63%
Retailer	Strategic collaborations	Employee empowerment	1.15%
		Consumer sensitization	1.11%
Supplier	Environmental conservation	Promoting green living.	3.74%
Distributor	Social values and ethics	Moral reflexivity	0.68%

Source: Author's compilation

4.6.3 The manufacturer segment

The manufacturer segment of the luxury fashion supply chain has four basic responsible management practices that jointly account for 5.01% of the total content. These four practices include preventing greenwashing, taking responsibility for one's actions, providing swift response to new challenges and managing business processes with blockchain. The first practice involves preventing greenwashing, which is the case when a manager deliberately offers misleading information to deceive consumers about the environmental friendliness of a company's product. The practice was identified from some data content as posted by one of the managers on July 23, 2019:

“My personal view is very heavily around the need for legislation and regulation in this space, especially at a time when it's becoming all the more ‘on-trend’ to reference sustaina-

bility as a brand, thus making greenwashing ever more of a reality when it's done with that in mind".

Another responsible management practice in the manufacturer segment of the luxury fashion supply chain relates to taking responsibility for one's action as a manager. The practice was drawn from sample content posted on August 8, 2018:

"What the industry needs (more than blockchain) are factors that will force upon them the desire for transparency and the need to take responsibility for their actions in production".

Swift response to new challenges is another responsible management practice in the manufacturer segment of the luxury fashion supply chain. An example of content from which the practice was drawn was published on March 7, 2017:

"We're in a world where things change very quickly. Sometimes we have to set up a new warehouse in a couple of days or engage with a new vendor in a country where we've never operated".

Finally, for the manufacturer segment, managers demonstrate responsibility by managing business processes using blockchain, as obtained from one of the Twitter profiles we tracked:

"We believe fashion brands should use blockchain technology and fully disclose all the processes, including wages and the list of chemicals used to make our clothes".

4.6.4 The retailer segment

The retailer segment of the luxury fashion supply chain has two key responsible management practices. First, employee empowerment, which constitutes 1.15% of the entire content and was extracted from Twitter profile content, is an example that includes the following:

"Fair Trade and Sustainable Fashion Label. We partner with organizations that pay fair wages. We believe in social responsibility".

The second responsible management practice, consumer sensitisation, accounts for 1.11% of the entire content and was taken from the following data extract:

“Mission: Creating a more responsible ecosystem for the fashion industry by educating & mobilizing consumers to be positive advocates”.

4.6.5 The supplier segment

The supplier segment was found to have one key responsible management practice, promoting green living, which accounted for 3.74% of the content share. We draw the practice from some data content, an example of which was published on March 4, 2020:

“I want to highlight how some brands are not only trying to use #sustainable and #recycledmaterials on their products, they're also trying to reduce their #carbonfootprint on every step on their supply chain, e.g., carbon-neutral transportation methods!”

4.6.6 The distributor segment

In the distributor category, we identified one responsible management practice, moral reflexivity, which involves thinking backwards to avoid previous problems when making new managerial decisions. This practice accounts for 0.68% of the share of content and was obtained from sample data published on June 28, 2019:

“Our goal was always to first maximize security, avoiding the problems of our past”.

4.6.7 The overall integration

As depicted in Table III, five responsible management practices were found to be integrated with the sustainability dimension of social value and ethics. These practices were not limited to one segment of the supply chain but spanned two categories (manufacturers and distributors) that are directly connected in the supply chain. Intuitively, this suggests that the responsible management practices derived from the interaction of actors in these segments of the luxury fashion supply chain are also drivers of sustainability within the system.

Furthermore, the responsible management practice of “promoting green living” found in the supplier segment is closely related to environmental conservation, which is an established sustainability practice in supply chain management. Similarly, the responsible management practice of employee empowerment corresponds with the sustainability practice of strategic collaborations, as suggested in the example data:

“The availability of cloud services, big data and analytics are not only empowering our employees but allowing us to strategically tailor consumer experience”.

These findings illustrate the positive association between responsible management practices and SSCM practices.

4.6.8 The effect of digital technology on responsible management

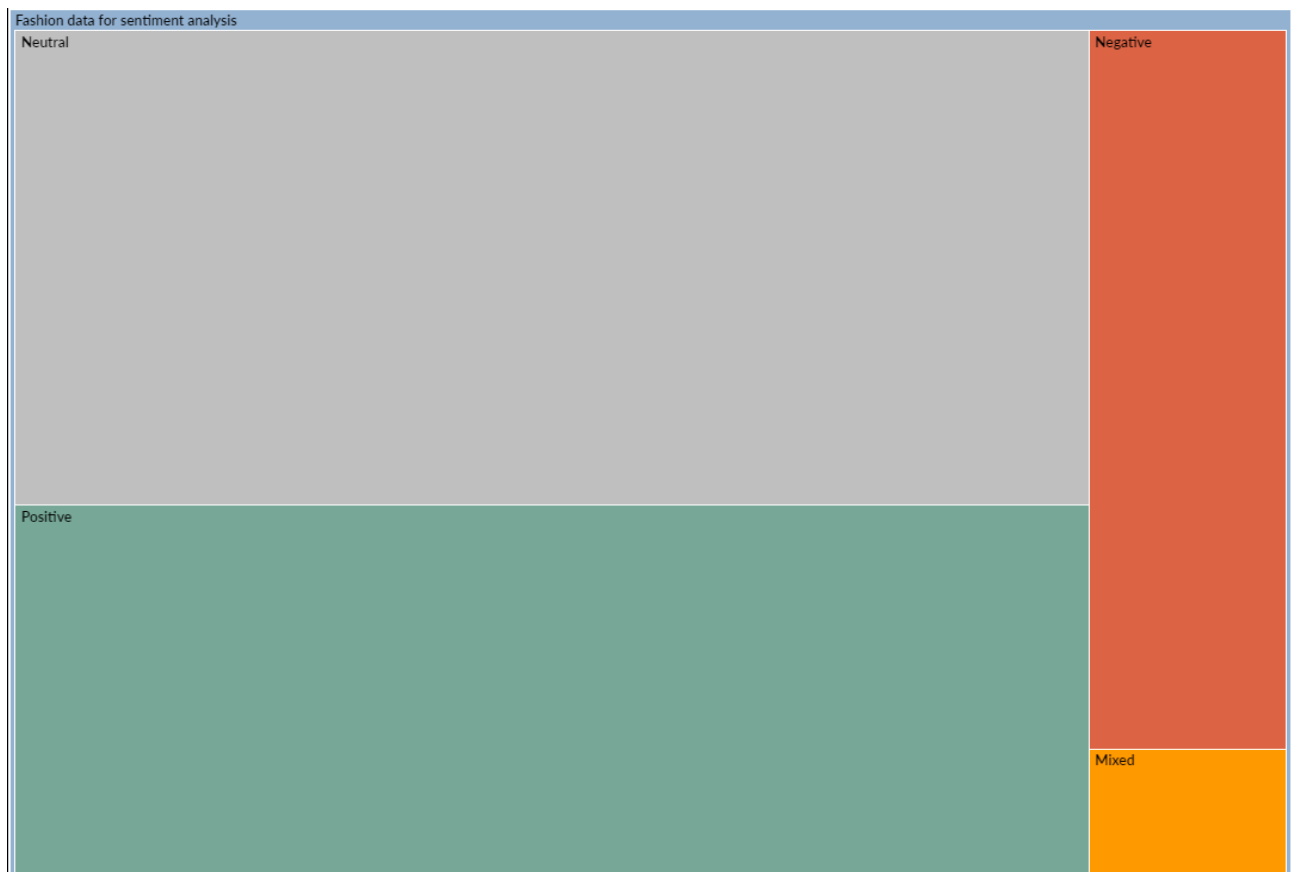
To answer our second research question regarding the contribution of digital technology, measured by blockchain, to responsible management (as shown in Table 4.4), the result of sentiment analysis performed on the opinions expressed by managers indicated that 83 statements made by managers across different supply chain echelons were neutral towards the role of blockchain in responsible management, 64 were positive and suggested that blockchain enhances responsible management practices, 23 were negative about responsible management practices, and 4 expressed mixed feelings. An illustration of the communicated sentiments is captured in Figure 4.2, while a further categorisation of some positive and negative sentiments as expressed by managers in different supply chain segments is provided in the appendix.

Table 4.4. Summary of managers' sentiments on the role of blockchain in responsible management

Sentiments	<i>Frequency</i>
Neutral	83
Positive	64
Negative	23
Mixed	4

Source: Author's compilation

Fig 4.2. Summary of managers' sentiments on the role of blockchain in managerial responsibility



Source: Author's elaboration

4.7 Discussion and conclusions

This study focused on two main objectives: the contribution of communicating responsible management to SSCM and the role of blockchain in responsible management practices. Drawing empirical data from the social media posts of managers in the luxury fashion supply chain, we deployed two analytical techniques within the framework of social media analytics, content analysis and sentiment analysis, to answer our research questions. The results of the content analysis identified eight major responsible management practices and their link to sustainability practices in the textile supply chain. The results of sentiment analysis of the managers' opinions regarding blockchain also revealed that most of the managers were neutral in their perception of blockchain in promoting managerial responsibility in the luxury fashion supply chain, while a substantial proportion expressed positive sentiments that blockchain enhances their responsible management practices. Some negative sentiments were equally expressed, mostly by managers in the retailer segment of the supply chain. One reason for the negative sentiment could be the technical requirements of blockchain, which might appear cumbersome for some actors in the retail section.

To the best of our knowledge, this is the first study to attempt to integrate the strands of literature on responsible management and SSCM. Moreover, while most previous studies on sustainability focused on organisations and brands, we deviate slightly from this by examining responsible management practices at the level of individual managers in each of the supply chain echelons. More specifically, we investigate what constitutes responsible management practices among managers of firms in the supply chain using the textile sector as our reference. The use of blockchain in managing the supply chain is gaining acceptance in global businesses, although there is little research on its role in promoting managerial responsibility. To fill this gap, we provide empirical evidence within the context of the luxury fashion supply chain.

4.7.1. Theoretical and practical implications

This study provides some theoretical and practical implications. Eight major responsible management practices spanning four important echelons of the luxury fashion supply chain were identified from the social media communications of managers. Four of the practices were obtained from managers in the manufacturing segment: preventing greenwashing, taking responsibility for one's actions, providing swift responses to new challenges, and managing business processes with blockchain. Greenwashing, which is a common irresponsible practice in the textile supply chain (Oelze, 2017), in this context refers to the situation where a manager willingly provides adulterated or deceptive information about the environmental friendliness of a company's product to deceive consumers. It is therefore the responsibility of managers to maintain practices and processes aimed at preventing greenwashing, for example, by strict adherence to regulatory standards. Moreover, managers take responsibility for their actions in production, thereby creating an avenue for transparency in the system. Another practice of managing responsibly in response to the dynamism that characterises modern businesses is providing swift responses to new challenges, such as setting up new facilities where necessary within the shortest time possible. Similarly, business processes such as wage setting and input sourcing should be managed on the blockchain.

The retailer segment has one key responsible management practice, employee empowerment, which involves providing employees with necessary facilities, fair emoluments and an enabling environment for them to thrive on the job. This is the definition of social responsibility as explicated by some managers, and it generates ripple effects on customer management by giving customers a good experience. Managers in the supplier category of the luxury fashion supply chain engage in the promotion of green living as a responsible management practice. This suggests that they engage in eco-friendly practices such as the use of recyclable materials that reduce environmental pollution and maintain carbon neutrality, in accordance with

the illustration of responsible management by Carroll *et al.* (2020) as the actions taken by managers to help the organisation achieve its CSR goals. Moral reflexivity is another responsible management practice that is associated with the distributor segment of the luxury fashion supply chain, as measured by the ability to prevent problems of the past through thought and reflection. Thus, the ability to engage in reflexive thinking affords managers the benefit of hindsight to identify previous irresponsible actions or activities of which they were previously oblivious. This lends support to the findings of Hibbert & Cunliffe (2015) that reflexivity is an important responsible management practice among business school students, who themselves are potential managers.

4.7.1.1 *Theoretical contributions*

Our study offers two main contributions to the literature.

First, the extant literature has identified a lack of connection between theory and practice as a major constraint in the budding field of responsible management (Laasch & Gherardi 2019; Hibbert & Cunliffe 2015). Our results provide concrete responsible management practices across the different echelons of the supply chain, drawing empirical evidence from the luxury fashion industry. The responsible management practices identified in this study through the social media (Twitter) posts of managers in the luxury fashion supply chain empirically validate the idea expressed by Antretter *et al.* (2018) and George *et al.* (2014) that the personal opinions communicated on digital platforms, particularly Twitter, by the individual stakeholders of organisations can be analysed to determine the social, economic and environmental impacts of business processes. Moreover, by identifying responsible management practices from the social media communications of managers in the luxury fashion supply chain where sustainability, responsibility and ethics are top priorities (Da Giau *et al.*, 2019), we illustrate the multifaceted nature of achieving sustainability by managing responsibly at each of the supply chain echelons.

Second, the main theoretical contribution of this study is the integration of the literature on responsible management and SSCM. We demonstrate the interrelationship between responsible management practices and existing sustainability practices in the supply chain, thus extending the drivers of SSCM identified in Dubey *et al.* (2017) to include responsible management. Our findings suggest that responsible management practices help promote sustainability in the supply chain, thus empirically validating the opinion of Carroll *et al.* (2020) that responsible management helps firms achieve their goals of improving society, the environment and the economy. Therefore, drawing evidence from the luxury fashion industry, we contribute to knowledge in the fields of responsible management and SSCM by positing that responsible managers shape a responsible organisation and that a major way of achieving SSCM is for individual managers to act responsibly in the discharge of their duties.

4.7.1.2. Managerial implications

We demonstrate that companies stand to gain the benefit of improved sustainability when managers communicate their responsible conduct on social media. One of the ways managers contribute to sustainable management is by promoting firms' efforts to align with public policies regarding social and environmental sustainability. Social media therefore presents managers with ample opportunities for managing firms' reputations through the sensitisation of customers and the general public. This underscores the need for firms to encourage their managers to publicise their responsible management practices, taking advantage of the wider spread of audiences that exists on social media compared to companies' websites, which have limited reach. It is not sufficient for managers to maintain responsible management practices; their responsible actions should be communicated on social media to keep the general public abreast of their performance with regard to responsibility.

The results of sentiment analysis place managers' opinions on blockchain in four categories: neutral, positive, negative, and mixed. The majority of managers hold either a neutral or a

positive view of the role of blockchain in responsible management. While the neutral views could be premised on the limited implementation of blockchain in the supply chain, which in turn suggests that managers might not have pragmatic experience of its impact on their practices, the positive opinions expressed by a large proportion of the managers are an indication that blockchain generally enhances the practice of managing responsibly. Specifically, blockchain contributes to social responsibility and environmental sustainability by helping managers improve customer engagement and preventing greenwashing in the supply chain. We contribute to knowledge by considering blockchain as a major driver of responsible management and sustainability in supply chains by demonstrating great potential that is only partially expressed.

Additionally, our study addresses practical concerns of sustainable management in the luxury fashion industry by identifying eight key responsible management practices that managers can use to ensure a sustainable supply network. Our approach enables us to emphasise responsible managerial practices in manufacturing by revealing the differences between supply chain echelons. Our study demonstrates how typical managers (not just CSR or ethics officers) may lead ethically based on their specific supply chain position. Moreover, we provide practical solutions for overcoming management challenges such as greenwashing, eco-friendliness and carbon neutrality by proposing the use of blockchain technology, which enhances responsible management practices. Consequently, we make a case for managers of the supply chain to embrace blockchain to enhance their ability to manage responsibly and to create a sustainable supply chain.

This study proposes that companies stand to gain the benefit of improved sustainability when managers communicate their responsible conduct on social media. One of the ways managers contribute to sustainable management is by promoting firms' efforts to align with public policies regarding social and environmental sustainability. Social media therefore presents man-

agers with ample opportunities to manage firms' reputations through the sensitisation of customers and the general public. This underscores the need for firms to encourage their managers to publicise their responsible management practices, taking advantage of the wider spread of audiences that exists on social media compared to companies' websites, which have limited reach. It is not sufficient for managers to maintain responsible management practices; these responsible actions should be communicated on social media to keep the general public abreast of their performance with regard to responsibility and to inform stakeholders of the company's commitment to sustainability initiatives.

4.7.2. Limitations and suggestions for further research

Despite the contribution made by the results of this study, it has limitations that translate into future research opportunities. The first limitation of this study is the reliance on publicly available data from social media, comprising corporate statements emanating from managers. While we recognise that social platforms are becoming an important tool for stakeholder engagement for corporate entities, what managers report in the media may be different from their actual practices, and this poses serious limitations to research of this nature. This study could therefore be methodologically enriched by employing in-depth interviews or ethnography in which managers could be closely observed by the researcher to ascertain the veracity of their social media posts. A second limitation is that only some content from the social media communications were found to be relevant to our research objective since we were particular about posts from individual managers (and not organisations), the majority of which we obtained only from Twitter. Therefore, this research could be deepened by considering data from other social media, such as LinkedIn and Facebook, or continued over time to increase the number of relevant communications. Third, although our empirical analysis focused on the luxury fashion industry, this study could be replicated across other sectors, such as agribusiness, fast-moving consumer goods, food and other industries within the manufacturing

space where social sustainability is crucial. Finally, the study refers to blockchain to assess the contribution of digital technologies to responsible management. Other digital technologies, such as the Internet of Things or artificial intelligence, could be considered in future studies.

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Chapter 5

Summary, conclusions, and suggestions for future research

5.1 Summary

There is an increasing awareness of blockchain on papers but only a few real-life use cases in companies such that the technology has almost become a cliché. Besides, little is known about the requirements for its implementation in specific industries as well as the different roles blockchain technology can play towards the achievement of a sustainable supply chain management system. Following these observations, this study sought to explore the pathway to achieving sustainability in supply chains by investigating the antecedents and consequences of blockchain implementation in two major industries where blockchain has found expressions; agriculture and luxury fashion. Adopting a thesis by publication approach, this report contains three distinct articles in which novel conceptualisations of blockchain implementation in supply chain management were presented.

The first article which constitutes the second chapter of this thesis analysed the interconnection of blockchain technology, social capital and sustainable supply chain management with the aim of positioning blockchain as a social capital and strategic resource that companies can utilise to gain more value and edge-out competitors. In the study which took an abductive approach because of the nascent nature of research in blockchain technology in SCM and the intent of theory building to set the ground for further investigations, empirical data was obtained from six Italian luxury fashion companies utilising blockchain technology for managing their supply chains and participating in the *extraitastyle* project that was launched in 2020 but which we code-named ‘Italiafashion’, to ensure anonymity of not just the project but also the selected firms. However, details of the firms such as size, year of establishment and the digital technologies engaged were well

documented. Triangulating available data from the 'Italiafashion' repository with other sources such as company websites, we performed multiple case studies by qualitatively analysing the data contents.

We first identified three main sustainability objectives firm pursue by engaging blockchain technology for managing their supply chains and they include product safety, brand authenticity and positioning. We then integrated two key theories; the social capital theory and RBV theories to produce a model that illustrates the resource-based view of social capital in a digital supply chain management system. The model resulted in the emergence of a concept known as 'digital supply chain social capital', with which we leveraged empirical data to demonstrate that a blockchain-enabled supply chain reinforces the supply chain network with two basic dimensions of social capital which are structural and relational, while the third dimension (cognitive) is negligible. Our findings also revealed that technological integration, such as blockchain combined with artificial intelligence or internet of things, improves the realisation of sustainable supply chain management.

In the second publication which is the third chapter of this thesis, the quest to increase pragmatic blockchain utilisation in Supply Chain Management (SCM) led to the investigation of blockchain application in the agrifood industry where there is need for transparency and traceability in product movement from the suppliers to producers and down to the end-users, as the world cannot afford another food-related crises. For this qualitative empirical study, we relied on business news and expert commentaries regarding blockchain utilisation in the agrifood value chain. Integrating two main theories, BRT and TOE, the study proposed a model that illustrates organisational adoption strategies, technical benefits and environmental constraints as important factors that shape managers' intention to use blockchain in SCM.

The third paper forms chapter four of my thesis. In the study, we explored how the communication of responsible management practices and the role of blockchain technology on social media could influence sustainable supply chain management. Social media, especially Twitter, is fast gaining traction in corporate communications; in fact, it has transcended entertainment and now being utilised by companies and their managers for publicising their company information, products and practices. Based on this realisation, we leverage an Application Programming Interface known as followerwonk and Microsoft azure to harvest the tweets of selected managers in the luxury fashion supply chain, on which we conducted social media analytics. Our results identified eight key responsible management practices and we also illustrated that blockchain essentially enhances responsible conduct in the luxury fashion supply chain.

Summarily, to ensure rigour and reliability of the empirical analyses conducted in this report, established procedures were followed. For instance, to do multiple case studies, we rely on the steps proposed by renowned scholars such as Yin (2013) and where necessary, studies were grounded in relevant theories. Transparency and replicability were equally ensured through a proper documentation of the data collection procedures for each article.

Synthesising the three papers, this thesis offers a new insight into the concept of blockchain-supply chain management integration with contributions to both theory and practice.

5.2 Contributions to theory

Lack of industry-specific implementation framework is a common gap identified in existing literature by leading scholars in blockchain and supply chain management research. To shore-up this gap, the findings of this study have produced two distinct models of blockchain application in specific industries. The first model tailored to the fashion industry is a resource-based view of social capital in a digital supply chain management system while the

second model presents the behavioural considerations of a blockchain-managed supply chain system in the agrifood industry.

The findings of this study have expanded the frontiers of blockchain-SSCM research beyond the usual focus on the determinants of technology acceptance as common with most studies in this emerging field. Thus, we channel new perspectives to the growing scientific discussions of blockchain adoption in supply chain management. Through an integration of the social capital and RBV theories, this study has developed and operationalised new constructs such as ‘digital supply chain social capital’. This implies that aside its deployment as a digital technology, blockchain should be viewed as a social capital in the supply chain, as it enhances the strength and pattern of relationship among supply chain stakeholders through its smart contract and distributed ledger technology.

Further, this study lends support to the arguments of BRT and TOE theories, by producing a framework that identifies organisational adoption strategies, technological benefits and environmental barriers as new antecedents of blockchain implementation in supply chain management.

Additionally, the concepts of responsible management and sustainable supply chain management are linked in this study, thus channelling a new paradigm for supply chain sustainability studies. This study therefore calls for focus on individual managers rather than organisations as unit of analysis when investigating sustainable supply chain management.

5.3 Practical implications

As an implication for practice, this thesis provides managers with a novel perspective of blockchain as a strategic social capital through which firms can gain competitive advantage. The revolution blockchain holds for managerial practice surpasses transparency, traceability data security, record keeping and related constructs commonly discussed in extant literature.

It extend to the enhancement of shared values and common goals as well as the realisation of common objectives in a supply chain network. Based on findings, managers should take cognizance of the fact that blockchain is not just another technology but a key resource which could help firms improve trust and strengthen relational ties among supply chain elements. From this realisation, this study therefore has the potential increase the adoption of blockchain technology in supply chain management.

Additionally, the behavioural antecedents identified in this study provide managers with new concrete justifications for adopting blockchain in their supply chains. Invariably, this thesis suggests new important factors for managers that might be considering blockchain implementation in managing their supply chains. For instance, before adopting blockchain technology, managers should ponder on its technical relevance, prevailing organisational strategies as well as environmental limitations to its implementation.

The study demonstrates that one way to achieve sustainability in the supply chain is for managers to conduct themselves responsibly in the discharge of their duties while ensuring that the responsible practices are well communicated on social media. In addition, blockchain has critical features that can help managers conduct themselves responsibly in their supply chain networks.

5.4 Suggestions for further research

Despite the contributions of this study, there are avenues for further research to advance the understanding of blockchain implementation in supply chain management. The propositions that emerged from this study can be subjected to further empirical tests using different methodologies.

Hopefully, in the nearest future, when blockchain technology must have gained more prominence in global business networks, the models and constructs proposed in this study can be operationalised using empirical data from large scale surveys of different industries.

Finally, to ensure clarity and depth of understanding about the subject matter, this study adopts blockchain as the only focal digital technology in the supply chain, future research can consider a mix of technologies such as blockchain with internet of things, artificial intelligence, or cloud computing. This is because in reality, firms use a combination of digital technologies to achieve operational efficiency and it could be an interesting topic for scientific research.