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A New Era of Strategic Investment Decision-Making Practices in UK Companies: Towards Sustainable Supply Chains and Circular Economy

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Abstract

Emerging global governance issues include economic, social and environmental problems. The COVID-19 pandemic and policies such as EU Green Deal and Brexit have led to great concerns about supply chains. Proactive strategies, adaptation and resilience are issues of significant importance for companies regarding seizing opportunities for business transformation. The evolution of crises associated with supply chains has been complex and resulted in widespread problems. Companies have enormous opportunities to revisit their business model and their strategic investment decision-making practices to play an active role in society. Industry 4.0 mechanisms, including big data, artificial intelligence, and advanced analytics, have brought unprecedented standards of ethics, governance, accounting, and accountability to the new era of supply chains. Successful strategic investment decision-making practices require a proper understanding of stakeholders' interests and expectations. Such understanding enables organizations to achieve effective planning and control of organizational and policy resources and successful value creation. Business model transformation towards a circular economy enables companies to achieve potential objectives, including increasing production efficiency, productivity, and quality, supplementing operational flexibility, contributing to safety issues and operational sustainability, and amalgamating the production system with stakeholders. The increasing concern about supply chain issues has raised a call for boardrooms to revisit their strategies toward sustainable supply chains. This paper aims to shed light on the contextual factors surrounding the new era of strategic investment decision-making practices in UK companies towards green sustainable supply chains and sustainable performance maximization. The methodology underlying this study is

based on a qualitative paradigm. The study utilizes secondary data, mainly the recent studies related to current issues in governance surrounding business model transformation. The conceptualization underpinning this study is rooted mainly in stakeholder theory and resource-based perspective. The results of this study articulate the wider stockholders' concern, and the debates underpinning this study have managerial and theoretical implications, including regulatory bodies, standard setters, decision-makers, and other stakeholders.

Keywords

Business Environment, Supply Chain Strategies, Circular Economy, Sustainability

1. Introduction

The increasing concern about supply chain issues has raised a call for boardrooms to revisit their strategies toward sustainable supply chains (SSCs). Business model transformation enables companies to reduce resource consumption costs through efficient and effective manufacturing processes. The evolution of crises associated with supply chains has been complex and resulted in widespread problems. This paper articulates supply chains related issues and highlights the need for a new era of strategic investment decision-making practices (SIDMPs). Particulate attention is paid to the amalgamation of Industry 4.0 strategy and SIDMPs towards SSCs and circular economy.

The big crunch of 2021 did not start overnight, and its cost will not be covered quickly. Over the past years, globalization extended companies' production and operational processes to different countries seeking lower costs. This meant for customers an extended period of higher prices. Further, many central banks in various countries are revisiting interest rates due to inflation issues. The COVID-19 pandemic caused significant disruptions to global operations and supply chains. The COVID-19 pandemic has hit the business world on an unprecedented scale and speed. It has caused the closures of businesses and the disruption to global manufacturing industries and their supply networks. Major industries, including automotive, electronics, pharmaceuticals, medical equipment and supplies, consumer goods and more, have been significantly affected (World Economic Forum, 2020).

The unprecedented crises and their disruptive effects are being examined through various theoretical lenses across countries. The COVID-19 pandemic outbreak severely affected supply chains and operational and strategic decisions around the globe (see Van Hoek, 2020; Queiroz et al., 2020; Schleper et al., 2021; Alam et al., 2021). In today's globalised economy, outsourcing business operations does not mean outsourcing responsibilities or risks. The COVID-19 has hit virtually all industries and production systems, creating significant distortions in

stocks and seriously disrupting operations in global supply chains. This inevitably led to considerable shortages in supplies and bottlenecks in logistic channels (World Economic Forum, 2020; Deloitte, 2020a; Chesbrough, 2020; Wang, Wang, & Wang, 2020; Singh et al., 2020; Sarkis, 2021).

2. Literature: Background

The UK's decision (Referendum, 23 June 2016) to leave the EU created significant risk and uncertainty for UK companies. The nature of such risk and uncertainty is different from other conventional/typical uncertainty shocks due to its depth, breadth, length and political complexity and ambiguity. However, the level of uncertainty has been higher for industrial sectors that are more dependent on trade with the EU as well as EU migrant labour. As a result, suppliers may be more hesitant to extend credit to their customers if unexpected trade policy changes, or economic conditions could possibly impact their ability to repay the debt. Furthermore, the uncertainty surrounding Brexit may also lead to increased transaction costs and delays in trade, which can further exacerbate the risk of extending trade credit.

Since early 2021, widespread disruption to supply chains in relation to gas hit the headlines globally. Supply chain problems have led to delayed deliveries, higher price, gaps in supermarket shelves and empty petrol stations. BP is just one of the companies who have reported issues[1]. The Office for National Statistics shows that 17% of adults in the UK experienced shortage of essential food items during the peak of the crisis and 37% struggled to get fuel during October 2021[2]. The causes of supply chain disruptions in the UK are complex due to the pandemic induced labour shortages, Brexit trade barriers, and global supply problems. In the UK, Brexit and long-term structural issues are playing a distinct role in labour shortages. COVID-19 has exacerbated staff shortages, e.g. many EU nationals working in the UK before the end of Brexit transition period moved back to their country of origin soon after the early stage of the pandemic start.

In addition to the problems associated with hiring staff from the EU, goods traded between the UK and the EU create additional costs and complexity to cross border trade. Global shipping costs have increased significantly. Many UK businesses remain reliant on importing raw materials and intermediate manufacturing parts/components from overseas. There are many global supply chain problems including energy, shipping issues and electronic components, semiconductors, printed circuit boards and microchips. Such issues have significant impacts on the supply of the new cars, electric devices, and home appliances. Manufacturing companies struggled to meet rising global demand[3].

Supply chains are the engines for today's global economy, serving delivering

[1]Office for National Statistics, Coronavirus and the social impacts on Great Britain: Personal experience of shortage of goods, 19 November 2021.

[2]Institute of Governance, https://www.instituteforgovernment.org.uk/publication/supply-chains.

[3]Institute of Governance, https://www.instituteforgovernment.org.uk/publication/supply-chains/causes.

goods and services around the world. COVID-19 has created unforeseen challenges, the full impact of revenue and profitability across value chains is still uncertain. Both ecological and ethical expectations of consumers will drive supply chains to determine how they source, serve and produce their products in sustainable eco-friendly and profitable ways. Yet, this may create challenges for constituents including consumers such as price increases and product unavailability. The COVID-19 pandemic raises call for companies to adopt resilience-oriented strategies to enhance supply chain including reconfiguration of the production systems, their operations, and the supply chains to ramp up production and minimize shortages (Baig et al., 2020; Deloitte, 2020b; Queiroz et al., 2020; Chowdhury et al., 2021; Ivanov, 2020, 2021; Choi, 2021).

3. Theoretical Framework

Companies can be considered as open systems because they collaborate with external stakeholders to manage critical resources. When companies lack certain resources, they establish relationships with other companies to obtain those required resources. Supply chains involve different companies with distinct levels of power, and companies depend on various resources, such as knowledge, raw materials, finance, and labour. According to the resource dependence theory, increased commitment to risk disclosure by a company's board can enhance access to crucial resources, such as finance, including trade credit. This theory emphasizes collaboration across organizational boundaries to reduce uncertainty. The triple bottom line (TBL) theory focuses on sustainability as the primary objective and incorporates three performance dimensions: economic, social, and environmental, enabling sustainable results. Based on TBL, the most critical objective of firms is to sustain profitability for the long term. The social sustainability dimension includes the social affairs of the relevant societies, human rights, and health services, whereas environmental sustainability includes paying attention to environmental changes and obeying ecological regulations. Most studies examining the green and sustainable manufacturing sector have a great potential to influence triple bottom line; economic, social, and environmental aspects. The stakeholder theory suggests that firms seek to gain the satisfaction of shareholders and other groups, including customers, suppliers, creditors, regulators and social groups to create a balance between shareholders and stakeholders to mitigate conflicts of interest among these groups. These issues resulted in the need for comprehensive disclosures of financial and non-financial information regarding strategies and mechanisms adopted by boards for leading and steering organizational resources. Our conceptual framework is depicted in **Figure 1** below.

4. Methodology

Research on the problems of accountability is largely conceptual and seeks to theorize the problems that can arise from greater demands for accountability.

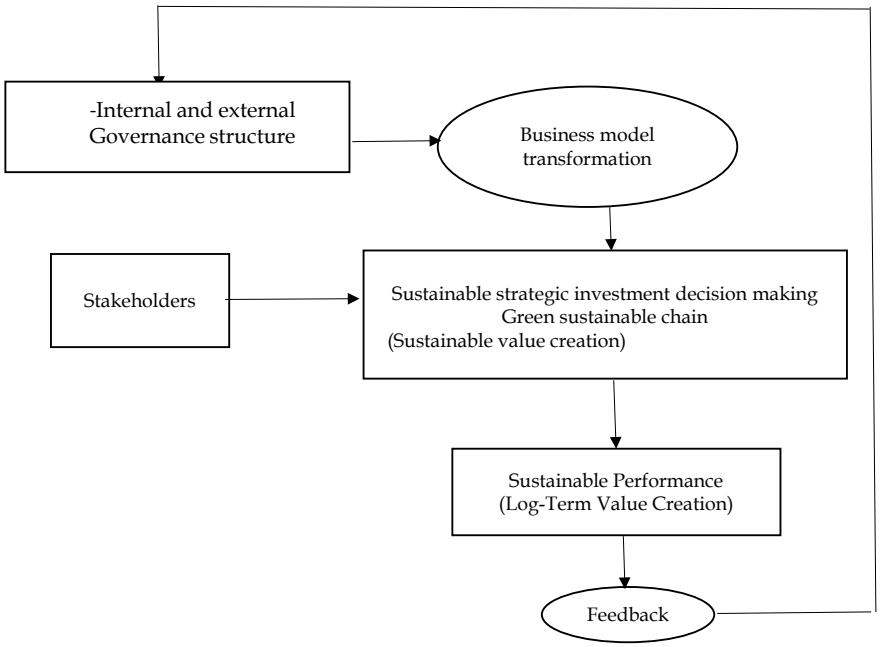

Figure 1. Conceptual model.

Dominant among these approaches are explorations of the qualities of the firm, aspects, and individual characteristics of senior executives. Research, specifically addressing senior executives, takes either an individual trait approach or a social identity approach. Our research method is based on interpretivist philosophy using a case study strategy rooted in general inductive paradigm. Critical discourse analysis is an increasingly interdisciplinary research paradigm to the study of the language. Critical discourse analysis research adopts linguistic and psychological approaches for analysing data from decidedly critical stances. Critical discourse analysis research not merely captures something important about the social world, but also plays key ethical and political roles in exploring how social phenomena are discursively established; it reveals how things come to be as they are. Language is an irreducible part of social life, dialectically interconnected with other elements of social life, so that social analysis can take place. If discourse refers to a particular view of an event, one could argue who creates those views? The development of Critical discourse analysis research has evidenced highly significant analysis of the contemporary public policy issues.

5. Discussion

Corporate governance is one of the most researched topics in the organizational field, with regulators, journalists and public policy decision makers all contributing alongside researchers. Corporate governance effectiveness remains open for debate in different settings. Governments must develop a deep understanding of their commercial partners' supply chains and the risks hidden behind their public statements. Supply chain organizations need robust strategy, and partnership with stakeholders to develop flexible mechanisms to achieve SSCs. Governments

must adopt effective due diligence processes and employ effective strategic control mechanisms to maintain SSCs (Alkaraan, 2017; Alkaraan & Floyd, 2020). SSCs are widely viewed as the management of environmental, social, and economic impacts and the encouragement of good governance and accountability practices embedded in SIDMPs. Thus, SSCs can be viewed also as key components of corporate sustainability, end-to end supply chain accountability is critical is critical now more than ever.

SIDMPs reflect the art and science of boardrooms practices regarding steering/controlling organisational resources and achieving organisational strategies. SIDMPs are complex, non-programmed, risky associated with uncertainty, involve substantial organisational resources and competitively oriented with a new strategic direction and long-term impacts (Alkaraan, 2020). Researchers have used various conceptual frameworks, including cognitive, social, cultural environmental, technological, and political aspects, to achieve a better understanding of SIDMPs[4]. The current globalization is faced by the challenge to meet the continuously growing worldwide demand for capital and consumer goods by simultaneously ensuring a sustainable evolvement of human existence in its social, environmental and economic dimensions. In order to cope with this challenge, industrial value creation must be geared towards SSCs and circular economy (Stock & Seliger, 2016). Successful SIDMPs require reliable, accessible, accurate, consistent, timely and contextual information (2020). To maintain alignment with organisational strategy, companies adopt and adapt pre-decision control mechanisms before and alongside SIDMPs. These pre-decision control mechanisms comprise intellectual and organisational principles and standards. This includes conventional and emergent analysis techniques, policies, procedures, compliance, and decision makers' judgements inherent in experience and a thorough knowledge of contextual factors of the business environment (see Alkaraan & Northcott, 2007; Carr, Kolehmainen, & Mitchell, 2010; Huikku, Karjalainen, & Seppala, 2018; Alkaraan, 2020; Alkaraan et al., 2023b).

The primary purpose of management control is to ensure that managers' behaviour is consistent with organizational strategies. This can be achieved by using appropriate control mechanisms to guide SIDMPs (Alkaraan & Floyd, 2020). These pre-decision controls influence and shape capital investment decisions before analysis techniques are even applied, by setting limits and criteria against which projects are evaluated. Effective strategic control mechanisms include conventional financial and risk analysis techniques as well as non-financial techniques. For example, carbon management control mechanisms are not only required for compliance with legislation, but may be crucial for maintaining companies' legitimacy, values and reputation. SIDMPs can be hindered by inadequate pre-decision control mechanisms, insufficient evaluation of strategic investments

[4]See Alkaraan and Northcott (2006); Northcott and Alkaraan (2007); Alkaraan and Northcott (2007); Carr, Kolehmainen, and Mitchell (2010); Alkaraan and Northcott (2013); Alkaraan (2015, 2016, 2017); Adel and Alkaraan (2019); Alkaraan (2020); Alkaraan and Floyd (2020); Alkaraan et al. (2022).

opportunities or incapability to attain synergy. Companies are required to carry out due diligence processes regarding SSCs. Failing to take reasonable action to make sure that supply of labour is legitimate can lead to significant legal, financial, and reputational risks to businesses. Companies need to do due diligence to make proper decisions on transactions in view of integrity aspects of supply chain. Companies are required to maintain their credibility, legitimacy, legal and tax compliance of suppliers, customers, employees, and labour supply[5]. Due diligence has become dramatically more complex over the last two decades. Typical steps of commercial due diligence include: 1) markets and competition; 2) review of target business plans; 3) synergy valuation; and 4) process support (Alkaraan, 2019).

The new era of SIDMPs is predominantly characterized as direct and indirect environmental, social, and economic contributions. In 2013, a long-term action plan for the manufacturing industry in the UK called for "Future of Manufacturing" to be implemented (Foresight, 2013). The global market for energy efficiency has been estimated at US$1.2 trillion by 2020 (Foresight, 2013), with the UK placed to capture value in the efficient production, transport, and building efficiency sectors as well as alternative fuels and water treatment technologies. The strategic development of intellectual property to support this, in the form of a business model and technological innovation, will improve companies' financial performance and create economic value. Yet, there is little evidence to suggest that UK companies are engaging with the essential circular economy agenda at the scale necessary to capture value proactively or productively given the more profound sustainability challenges that are projected to arise.

Government strategies predominantly drive guidelines for Industry 4.0 implementation. Examples of sustainability guidelines for Industry 4.0 within the UK context include minimizing material inputs, waste management, reduced water usage, energy efficiency, low-carbon technologies, supply chains with spare capacity, using material that is not land-filled but kept in productive loops, and products that use a smaller number of materials and are closer to consumers (see Foresight, 2013). Productive synergies between Industry 4.0 mechanisms and environmentally sustainable manufacturing processes rely on understanding the roles played by critical success factors, which organizations should consider carefully when simultaneously implementing Industry 4.0 and environmentally sustainable manufacturing (De Sousa Jabbour et al., 2018). The new era of SIDMPs in UK companies can be viewed as total integration of manufacturing systems, production processes, digital communications technologies, and automated machines. The development towards Industry 4.0 provides immense opportunities for the realization of sustainable manufacturing.

The new era of SIDMPs is combining the comprehensive integration of man-

[5]HM Revenue & Customs, May 2021, Advice on applying supply chain due diligence principles to assure your labour supply chains https://www.gov.uk/government/publications/use-of-labour-providers/advice-on-applying-supply-chain-due-diligence-principles-to-assure-your-labour-supply-chains.

ufacturing systems, production processes, digital communication technologies, automated machines, and other Industry 4.0 mechanisms towards SSCs and circular economy. This will be made possible through the following processes: 1) bringing products to market faster; 2) machines perform independent quality checks so errors can be detected and remedied faster; 3) smarter resource management based on energy data leading to optimized equipment maintenance; 4) improved stock management via using chips and sensors; 5) improved prediction of demand through data mining, which leads to improved supply chain and inventory management. This flexible, intelligent integration provides the means to leverage data and machine learning, empowering manufacturing companies to sidestep production issues and forecast unique opportunities (Jain & Mondal, 2017).

Industry 4.0 holds a great opportunity for realizing sustainable industrial value creation: economic, social, and environmental. Industry 4.0 strategy can be viewed along with new evolving business models. This development must be exploited for anchoring new sustainable business models. Sustainable business models significantly create positive or reduce negative impacts for the environment and/or society, or they can even fundamentally contribute to solving an environmental and/or social problem. Additionally, sustainable business models are necessarily characterized by competitiveness in the long run. In this context, selling the functionality and accessibility of products instead of only selling the tangible products will be a leading concept (Bocken et al., 2014; Schaltegger & Wagner, 2011).

Companies have witnessed the transformation of their core manufacturing activities, including product planning and development, supply chain management procurement, and marketing. These transformations have been underpinned by investing in Industry 4.0 strategies (Jabbour et al., 2019) which developed a conceptual framework incorporating Industry 4.0 mechanisms and a circular economy. These two paradigms gained the interest of wider stakeholders, including communities, scholars, governments, decision-makers, practitioners, regulatory bodies, and standard setters worldwide. Successful implementation of Industry 4.0 strategy will lead to more sustainable production and consumption patterns in developing countries, contributing to the implementation of the 2030 Agenda for Sustainable Development and the achievement of the sustainable development goals. This is relevant to Goal 9, to build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation, which is central to the work of UNIDO. A study conducted by the World Economic Forum indicates that there is US$0.67 trillion of value at stake for automotive players and a further US$3.1 trillion worth of societal benefits because of digital transformation of the automotive industry up until 2025. Industry stakeholders should take notice and come together to prioritize digital transformation initiatives given the potential for three times more value to be created for society than for industry. According to the WEF, there are three digital themes driving this change

in value throughout the automotive industry: 1) the connected traveller; 2) autonomous vehicles; and 3) the enterprise/ecosystem. The cycle of change begins with the connected and empowered consumer who is becoming more digitally conversant in all types of electronic media. This, in turn, is driving a seismic change in all aspects of transportation and, by extension, society. It is a fact that, for many, access to affordable transportation is the most important factor in lifting themselves out of poverty.

Industry 4.0 is expected to influence four long-term relationship paradigm shifts that are going to change the landscape of the global manufacturing industry: 1) factory and nature: improvements in resource efficiency and sustainability of manufacturing systems; 2) factory and local communities: increased geographical proximity and acceptance, integration of customers in design and manufacturing processes; 3) factory and value chains: distributed and responsive manufacturing through collaborative processes, enabling mass customization of products and services; and 4) factory and human interfaces and improved work conditions.

Industry 4.0 strategy can be viewed as paradigm shift from centralized to decentralized smart manufacturing and production. It refers to the computerization of manufacturing and the creation of a "smart factory". Using the Internet of things (IoT), CPS communicates and cooperates among each other and with humans in real time. Through the Internet of services (IoS), internal and cross-organizational services are offered and used by the value chain participants. Smart data is collected and processed throughout the whole product life cycle. This generates optimization of smart, flexible supply chains and distribution models, and efficient and optimized use of machines and equipment. Businesses can make quicker, smarter decisions, quickly responding to customer demands, while minimizing costs.

Research carried out by the World Economic Forum predicts that the opportunities of the industrial IoT will come in a form of new value created by gathering massive volumes of data from connected products, and the increased ability to make real-time, automated decisions. This will generate 1) improved operational efficiency via predictive maintenance and remote management; 2) an outcome of economy based on software-driven services, hardware innovations and increased visibility into products, processes, clients and collaborators; 3) ecosystems connected by software platforms that will better facilitate data creation, aggregation and exchange; and 4) new human-machine interactions that will increase productivity.

The expense of tooling and the need to produce high volumes to achieve economies of scale using traditional production methods, requires considerable up-front investment. With 3D printing, laser cutting, and robotic assembly, the ability to manufacture products economically in small batches, even in batches of one, becomes a real possibility. Customization could allow products to be accurately designed to the specific needs of each individual consumer, and with

the consumer being part of the design process. The use of 3D printing for the on-demand production of spare parts would also improve maintainability and extend the life cycle of products and equipment. It would also affect product design, meaning future 3D part maintenance can be built into the process.

Decision makers need to understand the influence of environmental, socio-technological and economic determinants on their strategic choices and SIDMPs (Alkaraan & Floyd, 2020). Currently, a new era of SIDMP in UK companies is emerging through a wave of strategic investment towards Industry 4.0 strategy, SSCs and circular economy. The new waves of M&A can be viewed as comprehensive integration of manufacturing systems, production processes, digital communications technologies, and automated machines. Industry 4.0 strategy will make supply chains and production processes more interconnected, efficient, and flexible, allowing mass-customization and virtual production (Alkaraan, 2021a; Alkaraan et al., 2022).

Companies that harness the power of big data and automation will have a competitive advantage in viability, efficiency, effectiveness, quality, and profitability. E-commerce boom elevates consumer expectations of flexible shopping, shipping, and other fulfilment choices. Conventional supply chains are complex, global, and interconnected. Focusing on supply chain resilience and risk prevention will enable companies mitigating adverse events. The transformation from loosely connected data, processes, and people towards fully integrated end-to-end supply chain will enhance visibility and viability. Resilience, agility, and flexibility are key focus of current business strategies regarding risk prevention. SSCs are rooted on technological, environmental, social and governance determinants that are fully integrated into successful SIDMPs.

A circular economy is based on sustainable life cycle. The key assumption underpinning circular economy is resource being kept as long as possible within the economic system, where materials that have undergone an entire lifecycle, from production to end stage, are returned to the economic system as input. Key characteristics of circular economy include: 1) minimising waste through superior design of materials, products, systems, and business models; 2) reducing materials use and consumption; 3) maximising how materials circulate throughout their lifecycle; 4) rethinking energy and materials intensive product and processes; € preserving and regenerating natural systems. Key principles of circular economy include the following: refuse, rethink, recover, recycle, repurpose, remanufacture, re-design, refurbish, re-use and reduce. Circular economy comprises; product life optimization and extension (repair and maintenance, refurbish, reuse, repurpose, recover, recycle, repurpose); alternative energy, energy efficiency, plastic alternatives and end-of-life solutions, sustainable water, pollution prevention (see Alkaraan et al., 2023a).

The circular economy creates complex ecosystems of materials and includes interdependencies and feedback loops. A circular economy is one that decouples resource consumption from growth. A circular economy is critical to improve

resilience by unlocking new avenues to access raw materials and overcoming barriers to end of life materials management. This drives customers' engagements and business model transformation. SSCs deliver value creation, reduce costs, spur productivity and drive returns. Industry 4.0 mechanisms provide visibility and improve SIDMPs regarding successful implementation of SSCs strategies. SSCs present a challenge due to the complexity and wide distribution of many links in the chains. Without Industry 4.0 mechanisms, it is challenging to maintain and coordinate the level of accountability to achieve successful SSCs strategy. However, digitalizing supply chain operations can be implanted gradually. Industry 4.0 mechanisms of such smart factory and digital supply chain solutions gather and analyse data by their very nature.

The horizontal integration across the entire value creation network describes the cross-company and company-internal intelligent crosslinking and digitalization of value creation modules throughout the value chain of a product life cycle and between value chains of adjoining product life cycles. The end-to-end engineering across the entire product life cycle describes the intelligent cross-linking and digitalization throughout all phases of a product life cycle: from the raw material acquisition to manufacturing system, product use and the product end of life. Vertical integration and networked manufacturing systems describe the intelligent cross-linking and digitalization within the different aggregation and hierarchical levels of a value creation module from manufacturing stations via manufacturing cells, lines, and factories, also integrating the associated value chain activities such as marketing and sales or technology development. The paradigm of Industry 4.0 is essentially outlined by three dimensions: 1) horizontal integration across the entire value creation network; 2) end-to-end engineering across the entire product life cycle; and 3) vertical integration and networked manufacturing systems.

Recent studies have examined what causes technological changes and how companies can respond to technological change (see Aggarwal, Posen, & Workiewicz, 2016; Alkaraan et al., 2022). Alkaraan et al. (2023b) examine sustainable strategic investment decision-making practices in UK companies. Findings of their study reveal how governance mechanisms moderate the synergy between Industry 4.0 and circular economy. Singh and Hess (2017: p. 124) suggest the term "transformation" rather than "change" emphasizes that an organization's digital transformation goes far beyond functional thinking and holistically considers the "comprehensiveness of actions" that must be taken to exploit the opportunities or avoid the threats that stem from digital technologies. Yet, there is little conceptual or empirical research that examines how companies are transforming towards Industry 4.0 strategy. It is important to understand boardrooms regarding this strategic domain on companies' leadership (Hussainey, Albitar, & Alkaraan, 2022; Alkaraan et al., 2022).

An increase in the use of smart products and AI will transform the desirable skillset of the labour force of the future. Companies will use machines and net-

work systems to automate tasks that can be done at lower costs and higher quality levels. This would enable humans to focus on tasks such as creative problem solving and collaboration. The optimistic scenario is that, in the long run, the industrial Internet would enable the creation of a blended workforce, where it is no longer humans versus machines but humans with machines (the concept of "human-cantered automation"). Compounded by the effects of globalization, workforce transformation will create many new opportunities in some regions; yet there will be a significant dislocation of jobs elsewhere. Additive manufacturing allows companies to maintain virtual inventories and to manufacture stock on demand. This enables manufacture on site on demand which eliminates fossil fuel usage and other resources used in overseas shipping and packing. It also has potential to use recycled plastics from within supply chain loops, e.g. raw material for 3D manufacturing processes. Online shopping has risen by approximately 150% since the start of COVID-19. Electronic drones and inventory management robots are examples of automated things that can be optimized with intelligent automation to improve workflow efficiency, optimize energy, and save on fossil fuel usage in the logistic network. Machine learning uses big data to help systems and connected devices adapt in real time to discover patterns, learning from experiences and thus automate agile and responsive workflows.

As regard to SSCs, the optimization measures resulting from these processes can significantly reduce waste and energy usage. Artificial intelligence technologies enable analysis of multiple data sets across the SSCs, tracking the status and location of packages to screening and scanning opportunities to combine shipments or utilize less resource-heavy logistics. Industry 4.0 mechanisms embedded in business model transformation towards circular economy allow companies to implement successful SSCs strategies. Particularly artificial intelligence, sensors, machine learning, blockchain, robots and automated things, additive manufacturing, industrial Internet of things (IIoT), and ERP systems can manage big data and complex processes.

Current issues in sustainability and governance mechanisms are comprehensively examined using various theatrical lenses in different contexts and settings (see Alkaraan, 2018, 2021a, 2021b, 2022, 2023). The UN Global Compact set out 10 criteria for measuring SSCs that cover areas of environmental practices, human rights, labor practices and corruption. These criteria are rooted in the assumption that socially responsible SIDMPs regarding products and processes innovation are not only good for people and planet but also good for sustainable value creation through building positive brand awareness, competitiveness, and long-term profitability. Boardrooms have continued to extend their commitment to responsible SIDMPs including their value chains from subsidiaries to suppliers. The business case regarding SSCs has evolved significantly. Many companies are currently incorporating SSCs into their SIDMPs to maintain their brand value, manage legal requirements and regulatory and reputational risks as well as accelerate their business model transformation towards circular economy. Such SIDMPs

regarding SSCs show boardrooms' commitment to advancing sustainable development in the context of sustainable development goals (SDGs). Companies that embedded SSCs in their SIDMPs achieved potential benefits including cost control, maintenance of brand loyalty and reputation and minimising risks and vulnerability. There is a further need to establish an effective infrastructure that is also cost-effective to cope with the higher levels of global inflation that have been caused by recent shocks to the global economy and deteriorating trade relations.

6. Conclusion

The objective of a sustainable business model is to create long-term environmental, social, and economic value for all stakeholders involved in the delivery of products and services to the marketplace. Companies' boardrooms need to revisit their strategic investment decision-making to reflect on their commitment and responsibility to demonstrate corporate social responsibility and adoption of best practices regarding sustainable logistics towards a circular economy. Successful business model transformation requires the adoption of sophisticated digital supply chain technologies that are embedded in Industry 4.0 mechanisms. Industry 4.0 mechanisms have a significant impact on the evolution of supply chain sustainability, governance, accounting, and accountability.

Successful strategic investment decision-making practices require a proper understanding of stakeholders' interests and expectations. This paper contributes to the current debate regarding the extension of stakeholder theory to include sustainable governance. Companies have enormous opportunities to revisit their business model and their strategic investment decision-making practices to play an active role in society. Industry 4.0 mechanisms, including big data, artificial intelligence, and advanced analytics, have brought about unprecedented standards of ethics, governance, accounting, and accountability in the new era of supply chains.

Business model transformation towards a circular economy enables companies to achieve potential objectives, including increasing production efficiency, productivity, and quality, supplementing operational flexibility, contributing to safety issues and operational sustainability, and amalgamating the production system with stakeholders. Findings are relevant to sustainable development goals, and they offer insights to decision-makers, regulatory bodies, and other stakeholders regarding the current practices and potential environmental, social, and economic impacts. Successful implementation of business model transformation requires a better understanding and analysis of stakeholders' interests and expectations to achieve the potential benefits of incorporating Industry 4.0 mechanisms into manufacturing processes. Such understanding enables organizations to achieve effective planning and control of organizational and policy resources and successful value creation.

Business model transformation is rooted in various innovation trajecto-

ries, product design, product and process innovation, and organisational and marketing innovation. With the rise of e-commerce, there are more product and shopping options than ever. To survive in a highly competitive business environment, companies need to adopt resilient solutions to maintain their sustainable supply chain strategy. Companies' social performance has become one of the strategic issues for companies. By seeking to improve environmental, social, and economic performance through responsible strategic investment decision-making practices, boardrooms can show evidence of their commitment to their stakeholders and society at large.

There is a need for boardrooms' commitment to responsibilities, including oversight and support and fully integrated organisational structure, sales, logistics, marketing, production, development, design, supply management, finance, human resources, and legal aspects. Successful implementation of business model transformation and innovation strategies requires setting consistent standards in line with regulatory bodies. Further, setting targets and benchmarks and guidelines regarding alternative performance measures must be clearly identified.

There is a need for the adoption of an integrated strategy combining companies, government, and other stakeholders toward strategic change at all levels of the supply chain. Digital technologies play a significant role in circular economy transitions through value creation and sustainable performance. This includes investment in capability development, vertical and horizontal integration, effective procurement practices and effective strategic control mechanisms. Therefore, it is critical for companies to prioritize their strategies and identify areas that present the greatest risk on environmental and social issues, including human rights, labour, and ethical issues in the companies' supply chain. By creating shared values between society and shareholders, companies can maintain long-term success, legitimacy, and credibility.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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