

# Role of Digital Technologies for Sustainable Innovation and Value Creation: A Narrative Review

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## *Abstract*

*The purpose of this review paper is to examine the role of cutting-edge technologies in various aspects of supply chain processes as a part of a strategic plan for driving sustainable innovation. Furthermore, the study also explores the impact of digitization on modernizing supply chain operations from an industry 4.0 perspective for value creation. The study implies a narrative qualitative review for the interpretation of analyzed data from the selected articles and is based on analytical, and logical reasoning to determine patterns, relationships, or trends within the realm of the chosen subject matter for this study. The literature reveals that the implication of cutting-edge technologies as a strategic part of supply chain operations is significantly important for sustainable innovation and value creation of the company. The findings of the study will have implications for the supply chain managers for creating value for their organizations, stakeholders, and customers. Moreover, the study will also provide the essential knowledge for the development of the theory in the same domain for future researchers.*

**Keywords:** Supply chain management, Innovation management, Value creation, Sustainability, Cutting-edge technology.

**Paper Type:** Review Paper

## **Introduction**

Sustainability transformation through innovations has become more significant than ever in the digital age for sustainable businesses (Reis *et al.*, 2018). However, sustainability and innovation together sometimes seem to be a conundrum. Sustainability is about preserving the world as it is today whereas innovation is about creating new things that change the world (Maier *et al.*, 2020) but, it has become a global challenge to have both together at the same time. Sustainability strategy has now become a more important foundational moderator between digital business strategy and financial performance for every industry (Ukko *et al.*, 2019). With the rise in demand in this global economy of the technological era, it is the toughest challenge for companies to achieve sustainability from all aspects (Economical, Social, and Environmental). Therefore, it becomes more important to find a way to reconcile sustainability and innovation. Rethinking sustainability from all its three-dimensional aspects has been a major concern, and greatest challenge in today's modern world (Achillas *et al.*, 2018). Thus, new innovations like integrating digital technologies in various aspects of business processes have become more important than ever. All businesses are surrounded by complexity, volatility, and evolving technologies that challenge businesses at every corner (Water, 2003). Businesses need to make decisions sooner and faster than ever before. Hence,

the supply chain becomes utterly important for delivering a competitive edge as it encompasses an extensive range of business processes. Managing supply and demand touches manufacturing of raw materials, inventory management, distribution logistics, and capacity planning, among others.

The world has changed a lot since the 1960s, but it is a surprising fact that the supply chain has remained the same for the organizations (Water, 2009). Although there have been some changes in the capabilities, the overall processes are almost the same at the fundamental level. Before, the 1960s, inventory management mostly meant that when a company's inventory of a part or product was depleted to a certain point, the company would order more, and then came material requirements planning (MRP) (Stadtler, 2008). Instead of just one objective, to replenish inventory, MRP had three and added some level of integration for supply chain information. Moreover, shifting to MRP-II, added additional resources and people in the planning which integrates planning for a variety of operational processes (e.g., capacity planning, production scheduling, and resource management). MRP-II was succeeded by an advanced planning system (APS) which recognized that some plans that look ideal using MRP or MRP-II might not be feasible and added the idea of constraints (Stadtler, 2008). With all these added capabilities the supply chain efficiencies improved. However, the underlying processes didn't change much as the people and the processes still function in silos. Today's supply chains are massive, and a structural change is clearly needed to keep up. Every product has its own unique supply chain process which can be a complicated or even longer process (Water, 2009; Water 2003; Stadtler, 2008). Supply chains are not contained within a single organization, but they have a distinct and unique position in linking external suppliers and customers. No organization works in isolation, and managers increasingly recognize that they are members of a supply chain whose aim is to satisfy the final customers (Water, 2003).

The attraction toward conventional supply chain management planning for the organization has been seen since the 1990s (Cordell & Thompson, 2019). However, the strategic planning and sustainability factors for more sophisticated value creation have been unusual. In previous studies, it has been found that collaboration through intelligent e-business networks is the key to value creation in supply chain management (Horvath, 2001; Klibi *et al.*, 2010). In a study conducted by Nasiri *et al.* (2021), it was found that small-sized firms are usually attracted to sustainable innovation. Moreover, their results show that companies highly engaged with digital orientation in their operational activities have contributed a prominent level of significance to sustainable innovation than those who are less likely to be involved in digital orientation. However, in the context of large enterprises, more research is essential in the future to understand the role of digital technologies in sustainable innovation transition.

According to Sen (2009), the application of green supply chain management can be the stand-out model for value creation for organizations. Furthermore, Johnsen *et al.* (2018) mentioned that strategic challenges for business and society have boosted the importance of sustainability in each of its three dimensions. However, modernizing the supply chain through digital transformation with integrated cutting-edge technologies like artificial intelligence (AI), the internet of things (IoT), machine learning algorithms (MLA), and blockchain technology (BCT) in its processes is an area needed to be considered more attention. Lesser studies have been conducted on the potentiality of cutting-edge technologies to impact innovation for sustainability as well value creation for the companies. Therefore, it is necessary to fill these gaps to understand the realm of modern cutting-edge technology's impact on sustainability innovation value creation for sustainable business practices. Hence, this study is aimed to enhance the understanding of the potentiality of integrating modern cutting-edge technologies as a strategic part of sustainable innovation and value creation.

This inquiry is logical and objective, applying every possible test to verify the data collected and the relevant procedure employed on it. The main objective of this study is to empirically investigate the role of cutting-edge technologies as an integrated strategic part of supply chain processes for value creation and sustainable innovation. Moreover, the study also aims to examine the impact of modern cutting-edge technology in the supply chain processes from an industry 4.0 perspective to gain familiarity and achieve new insight into the phenomenon of integrating technologies like Blockchain, Artificial Intelligence (AI), IoT solution, Machine Learning, etc. for digitalizing the modern-day businesses for a new kind of economy. Furthermore, digitalization's impact on sustainability aspects as an integrated part of innovation for sustainable business will also be investigated through this study.

Based on the lack of empirical research and lesser studies on the role of cutting-edge technologies in the value creation and sustainable innovation for sustainable businesses, this study seeks to enlarge the current literature on the domain by answering the following research questions:

*R1: What impact do cutting-edge technologies have as an integrated part of the business model in the supply chain for value creation?*

*R2: What impact do cutting-edge technologies play as an integrated strategic part of the supply chain in sustainable innovation for sustainable businesses?*

## **Cutting-edge technology in the supply chain for value creation**

The success of the firm depends on its effort and ability to innovate in its environment according to the changing market (Ander & Kapoor, 2010) and the firm's competitive benefits entirely depend on its ability to create more value than its rival companies (Porter, 1985). However, understanding firms' performance in creating more value in a highly competitive and dynamic ecosystem requires more sophisticated strategies to innovate. The new global era of connectivity and digital innovation brings opportunity and empowerment for people, firms, and the government. Cutting-edge technologies hold enormous potential for achieving sustainable development goals and tackling global environmental challenges thus creating more value (Ross, 2015). In a few years of time digitalization has gone even further with a massive acceleration considering the facts of COVID-19, there is a significant change in consumer behavior, business processes, supply chain, and logistics operations (Indriastuli *et al.*, 2020). Chen *et al* (2015) have mentioned that there is a massive need for digital transformation for organizations for creating more value for the stakeholders. However, despite the urgency of change for organizations, integrating cutting-edge technologies into the various aspects of their businesses is still not feasible for many firms.

Modernizing the supply chain with cutting-edge technologies and concurrent planning is important to drive sustainable transformation for better business results. However, setting up for the future requires being ready to take more advantage of further technological advances if the company modernizes its supply chain to 4.0. Data, process, and people are the three parts of modern supply chain 4.0 (Ivanov *et al.*, 2019). Data is about accessing, linking, and making sense of it hence, cutting-edge technology like IoT plays a vital role in getting more data quickly in greater volume, and more consistently. The process side of supply chain 4.0 uses the collected data to make the decisions faster through machine learning algorithms, thus building an intelligent supply chain. Machine learning and artificial intelligence can take a large volume of data they receive and use it to

make predictions. The third part of supply chain 4.0 includes the people side, which is about social, context-driven interaction between people who need to collaborate to make the decision together. All three parts (data, process, and people) are required to modernize planning (Ivanov *et al.*, 2019). Therefore, it can be argued that digitalizing the supply chain with cutting-edge technologies (like Artificial Intelligence, Machine Learning Algorithms, IoT, Blockchains, etc.) impacts additional values to the firms and its stakeholder through interconnecting its different processes.

## **Cutting-edge technology in the supply chain for sustainable Innovation**

Sustainable business is not simply a matter of some things being sustainable and other things being unsustainable therefore what is most importantly needed is a spectrum of sustainability and creating innovation plays a key role. It is only through continuous innovation; that sustainable business can be achieved. Over the years, technology has pushed the boundaries and limitations of the businesses from one country to another such that the market is growing more competitive and saturated with many players in the same industrial category (Ross, 2016). Therefore, it becomes utterly important that companies adopt innovative strategic solutions and adopt modern technologies to incorporate innovation through the adoption of cutting-edge technologies. Moreover, technology, innovation, and communication networks are the key factors that push a business headlong and make it more competitive (Bricher and Müller, 2020). Because of rapid growth and advancement of the technology sectors like transport, information, etc. The global supply chain network has become more complicated leading to increased competition throughout the globe, and this has changed the business environment (Grant *et al.*, 2017). In this age of information, everything that has been dumb and disconnected is now wired intelligently. Almost everything (like cars, cities, ports, farms, etc.) will be wired in with the sensors and can be a game-changer. (Hugos, 2018). All the technologies will amplify each other such that quantum computing will fuel big data, the internet of things will fuel AI, and deep learning which fuels robotics and a storm of change will be combinatorial (Hugos, 2018; Merkas *et al.*, 2020).

Nasiri *et al.* (2020) showed in their research that there is a mutual relationship between digital transformation and relationship performance. They found that the digital transformation of companies solely cannot enhance the performance in their digital supply chain operation, it is only enhanced when smart technologies are integrated into it. Similarly, Gezging *et al* (2017) found that combining digital applications with operational changes helps yield significant performance improvement in raising supply chain performance to a new level. In today's world, modern cutting- edge technologies trends continue to shape the industrial world opening a new bunch of opportunities across a wide range of spectrum and are the key drivers for the digital transformation that has the potential to incorporate a new source of growth (Kersten *et al.*, 2019). However, adapting the wave of cutting-edge technologies into the system of businesses is always a complex challenge.

Modern technologies are an essential module for the firm as an essential part of the business to drive transformation and create better value for staying competitive thus shifting the paradigm of the supply chain processes. According to Mentzer *et al* (2000), top management plays a critical role in shaping an organization, aiming at the importance of communication and information technology. Moreover, the acceleration of digital disruption is stepping high thus, growing gravity on manufacturing companies to implement cutting-edge technology (Bell, 2020). Furthermore, blockchain technology and the internet of things can be a new evolution from the industry 4.0

perspective to bring reliability, growth, value, and sustainability to the firm. A peer-to-peer network is shared in a blockchain technology system, which is automatically updated regarding any changes in the system and keeps tracking who owns what (Shah *et al.*, 2019) which means anything can be tracked in the system of blockchain. Therefore, it can be argued that cutting-edge technologies are pioneering in transforming sustainability innovation. However, the impacts of these cutting-edge technologies in creating value need to be explored more through in-depth analysis with the likes of the rise of electric vehicles, transparencies in transactions through blockchains, etc.

## Conclusion, Implications, and Limitations

This new global era of connectivity and digital innovation brings opportunity and empowerment for people, firms, and the government (Nasiri *et al.*, 2020). The literature reveals that digital technologies hold enormous potential for achieving the Sustainable Development Goals, tackling global environmental challenges, and creating more value for the companies, and all the stakeholders. Everything that has been dumb and disconnected is now wired intelligently, like cars, cities, ports, farms, and even our bodies will be wired in with the sensors and will talk to each other. These changes are also combinatorial, and they amplify each other creating a perfect storm of change in sustainability transition. With the rise in technology, the market has become more competitive, and in the sequence of digitalization of the businesses, the trend of fueling each other will rise even more in the future (Matt *et al.*, 2015). Quantum computing will fuel big data, the internet of things will fuel AI, and Deep Learning which will fuel Robotics, meaning that everything will be automated. However, anything which cannot be automated will become significantly important in the future. For instance, human-only traits such as creativity, imagination, intuition, emotion, and ethics will be even more important in the future because machines are exceptionally good at simulating but not at being. In the future, we need to go beyond technology and data to reach human insights and wisdom. Technology represents the “how” of change, but the human represents the “why”? The future of the companies will be about the holistic business model. Not a single improvement but complete transformations, not individual systems but a new ecosystem. In a nutshell, from the investigation through this review paper it can be concluded that whether it is a matter of tracking valuable assets or allowing consumers to discover more about sustainable purchasing of products, digital technologies (like AI, ML, IoT, BCT, etc.) are making the supply chain more efficient, and transparent ever than before. The future is in Technology, yet the bigger future lies in transcending it.

The study under the topic “Cutting Edge Technologies as a part of Strategic Plan in Supply Chain drives Sustainable Innovation and Value Creation for Sustainable Businesses” will contribute to developing theory for future research as an additional knowledge within the realm of the same domain. This investigation will provide evidence for the pioneering role of cutting-edge technologies that leads to sustainable innovation practices, and value creation for sustainable transformation of the businesses, and helps to further deepen the horizons regarding the important role of transcending the digital technologies into the business processes for better value. The findings of this investigative study will provide interesting managerial implications that support companies to understand the innovative factors driving sustainable business from a Multinational (born global), and medium-sized company’s perspective. However, limitations regarding the issues with the study include the validity of generalization given that a particular topic is used. Further, the novelty effect and visuals may make the material easier to recall.

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