

Supply Chain Resilience and Flexibility Through Digitalization: Robotic Process Automation, Artificial Intelligence, and Blockchain

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Abstract: With the advent of the Industry 4.0 era and the emergence of new devices and technologies, many corporate supply chains are finding the right path to adapt to the Industry 4.0 environment. In this paper, an analysis of current research reveals that we still need to address how to make the right changes to corporate supply chains under the influence of Industry 4.0. This paper will consider its practical model. Based on this analysis, this paper uses a case study approach to examine how supply chains have evolved in recent years. The main objectives of this paper are to introduce the technologies associated with Industry 4.0; to analyze the changes in corporate supply chains because of Industry 4.0; to explore the prospects for supply chain development; to analyze ways corporate management can be improved; and to make relevant recommendations.

Keywords: supply chain, RPA, AI, blockchain

1. Introduction

For a long time, many companies have chosen to minimize inventory in pursuit of lean production and real-time production models [1]. However, this method can only be established on the logic of close coupling between the industrial and supply chains and requires the industrial chain supply chain to be in a relatively stable environment. When encountering crises such as COVID-19, there are often situations that cannot be handled in time and rebound quickly. In other words, enterprises still need to improve their resilience [2]. In reshaping the global supply chain, how can enterprises strengthen their ability to respond to crises and find safer and more resilient production and inventory management models? This shows how digitalization can help businesses' resilience and crisis response capabilities. Through three technologies, Robotic Process Automation (RPA), Artificial Intelligence (AI), and Blockchain. RPA saves more labour costs for the enterprise and, secondly, improves the team's efficiency. Employees can focus their energy on work that better reflects their value.

Similarly, the benefit of artificial intelligence is the ability to analyze a large amount of data quickly, making project plans suitable for the enterprise in advance. For online retailers, it can significantly improve warehouse productivity and response speed. Finally, blockchain is characterized by cost reduction and establishing mutual trust between manufacturers and product providers upstream and downstream. These technologies can fundamentally improve the resilience of enterprises. So how do these technologies operate?

2. Literature Review

Digitalization makes customization, flexibility, agility, and resilience a reality [3]. The global market fragmentation also puts higher requirements for the level of supply chain digitalization [4]. Only through Digital transformation can we cope with crises and uncertainties and can large-scale customized production become possible. Supply chain digitization can be defined as making effective decisions for supply chain activities from upstream to downstream, driven by digital technology, based on sufficient supply chain information [5]. Robotic Process Automation (RPA), Artificial Intelligence, and Blockchain are crucial technologies [6, 7].

With globalization and technological advances, supply chain management has become increasingly complex [8]. Traditional supply chain models face problems such as information asymmetry, opaque processes, and lagging decision-making. The emergence of supply chain digitization provides a new way to solve these problems. The core of supply chain digitization lies in using digital technology and information systems to achieve data sharing, real-time collaboration, and business process optimization in all parts of the supply chain. Through technologies such as the Internet of Things, cloud computing, and big data analysis, enterprises can obtain more comprehensive and accurate supply chain information and make rapid decisions and responses [9].

However, digitization of the supply chain also faces several challenges. These include data security and privacy protection, technology and talent development and development, and the need for corporate culture and organizational change. To successfully implement supply chain digitization, companies need to build a strong IT infrastructure, develop a clear digitization strategy, and enhance internal training and communication. Overall, digitization of the supply chain offers companies new ways to optimize their supply chain management. Through digital technology, companies can achieve real-time information sharing, rapid response in decision-making, and improved supply chain efficiency and flexibility. As technology continues to advance and applications spread, supply chain digitization will continue to develop in the future and profoundly impact companies' competitiveness [10].

3. Digital Technology

3.1. RPA

Logistics and supply chains are among the world's fastest growing and most competitive industries. So, what are the core values of the supply chain? Ultimately, it is how to minimize costs and maximize investment returns. Over the years, companies have invested billions of dollars in expanding their processes and infrastructure, seeking opportunities to reduce costs and increase efficiency. This is where RPA comes into play. The supply chain largely relies on backend operations to undertake challenging tasks, such as arranging shipments and deliveries. Most manufacturers and suppliers have supply chain management, but data integration and workflow are still the most significant challenges. Suppose RPA technology can assist employees in completing repetitive tasks and tasks on digital devices such as computers and mobile phones. Enabling the backend program to track progress automatically will not only improve the production efficiency and accuracy of the supply chain but also save significant costs.

At the same time, manual errors will also be avoided, and the core data of the enterprise will also be protected. As is well known, there are three streams in the supply chain: "Capital flow", "commodity flow", and "information flow". The first two are well understood and well operated, but information flow is difficult to achieve. Because information is crucial to a company, sharing information among suppliers, manufacturers, and retailers takes much work. Data sharing has always been done manually, and with RPA technology, once encountering unexpected situations, the backend can

communicate with the department in the shortest possible time. Data analysis and production planning can also be automated.

3.2. Artificial Intelligence

Artificial intelligence can make automation technology operate better. However, combining the Internet of Things and artificial intelligence can enable a more profound data analysis and make decisions based on current situations. By combining the two, robots can track and locate inventory and use less labor for selection and packaging functions. Automation brings about more efficient resource allocation. At the same time, more excellent machine learning algorithms can extract insights into logistics forecasting that are crucial for decision-making. Artificial intelligence can help make decisions about capacity planning, forecasting, and network optimization, simplifying operations and improving overall supply chain performance. For many companies, obtaining information has become as easy as pie.

Nevertheless, how to use this data is the current challenge. The Internet and artificial intelligence are not two sides of the same coin. They have a symbiotic relationship. The more data AI receives about actions and interactions, the more it can understand how to adapt to current conditions and make decisions. Artificial intelligence can help the logistics industry redefine today's behavior and practices, from prediction to predictive planning, from standardization to personalized services. It also allows logistics companies to optimize network coordination, an efficiency that cannot be achieved solely by human thinking.

3.3. Blockchain

The unique characteristics of blockchain technology, such as data transparency, non-tampering, decentralization, and traceability, are precisely what is needed in supply chain quality management. The distributed nature of blockchain can prevent tampering and modification, as every operation on the blockchain is completely transparent. Conversely, the data stored on the chain can remain authentic because it records the security of each transaction, guiding suppliers to comply with the production safety standards proposed by manufacturers strictly. By combining blockchain's unique ledger recording characteristics with the Internet of Things technology, embedded sensors, and RFID tags are used to access product information, record preservation, and more efficiently collect and record information from the source of goods. The traceability of raw material sources, production processes, processing links, warehousing information, and logistics operations can be traced throughout the process. Moreover, because the information is public and transparent, everyone on the chain can record and view it. Not only does it achieve information sharing, but it also allows customers to feel more at ease.

4. Conclusion

Digitize enterprise supply chains through robot process automation, artificial intelligence, and blockchain. Make it more flexible and able to respond quickly to environmental changes and sudden situations. Secondly, it also reduces the cost of the supply chain, achieves more significant cost reduction and efficiency enhancement, restructures the economic operation mode, and profoundly impacts enterprises' business management and cost expenses. At the same time, it also enhances the resilience of enterprises, and digital technology can effectively identify, respond to, and monitor the risk of supply chain interruption. The environment of the supply chain ecosystem is constantly changing, and natural disasters and various emergencies can lead to supply chain disruptions. With the help of business process whole process monitoring, it can provide enterprises with immediate warning information and improve the supply chain's rapid response capability. Give full play to the supporting role

of supply chain digitization in supplementing, fixing, and strengthening the supply chain work and enhancing the resilience and flexibility of the supply chain ecosystem.

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