

The Impact of Scientific and Technological Innovation on the Risk Immunity of the Quality Chain from the Perspective of Global Value Chain Embeddedness

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Abstract: The study examined the mechanism of the impact of STI on risk immunization in the quality chain. It was found that science and technology innovation has a significant impact on quality chain risk immunization. With the wide application of advanced technologies such as Internet of Things (IoT) technology, big data analytics and artificial intelligence, new opportunities have arisen for enterprises to manage risks in the quality chain. The application of these technologies enables enterprises to more accurately identify, assess and control various risk factors in the quality chain, which improves their risk immunity. The application of Internet of Things (IoT) technology enables enterprises to monitor and track the operation of the entire supply chain in real time, quickly identify potential problems and take appropriate measures. At the same time, the application of artificial intelligence enables enterprises to quickly process and analyze quality chain data through intelligent algorithms, providing more accurate support for enterprise decision-making. Scientific and technological innovation provides strong support for enterprises to optimize the quality chain risk immunization strategy, brings continuous enhancement and improvement, and provides important opportunities and challenges for enterprises to continuously optimize the quality chain risk immunization strategy.

Keywords: Quality Chain Risk Immunization; Science, Technology and Innovation; GVC Embedding Perspective

1. Introduction

In today's globalized and competitive business

environment, the importance of quality chain risks is becoming increasingly evident. As the global supply network continues to expand and the complexity of the quality chain increases, companies are faced with many potential challenges and risks^[1]. Risks such as supply chain disruptions, product quality problems, and safety hazards may directly affect an enterprise's reputation, market share, and even survival and development. Against this background, enterprises need to develop a comprehensive quality chain risk management program to ensure that potential risks are prevented and countermeasures are taken. Firstly, enterprises should have an in-depth understanding of the structure and characteristics of their supply chain, conduct risk assessment of key links, and identify potential risk points and weak links. Second, establish an effective supplier management mechanism, including supplier auditing, signing of cooperation agreements, supplier performance evaluation and other links, to ensure that suppliers meet the quality standards and requirements of the enterprise. In addition, the enterprise should also strengthen internal quality management, including the establishment of quality monitoring system, strengthening staff training, promoting quality culture construction and other measures to ensure stable and reliable quality of products and services. In addition, enterprises should also establish emergency plans and crisis management mechanisms, so that they can quickly respond and deal with unexpected events such as supply chain disruptions and product quality problems to minimize losses and negative impacts.

Science, technology and innovation (STI), as a powerful driving force, is transforming and shaping all walks of life. In the field of quality chain management, STI is also playing an

increasingly important role, enabling organizations to better identify, predict and respond to potential risks^[2]. In addition, digitalization and intelligent transformation have provided more powerful tools for monitoring and controlling the quality chain, providing important references and insights for companies and decision makers to better respond to quality chain risks and ensure the safety and stability of the quality chain^[3].

2. Literature Review

Global Value Chain. (hereinafter referred to as GVC). It refers to a global cross-business network organization that connects the processes of production, distribution and recycling to realize the value of goods or services, involving the entire process from the procurement and transportation of raw materials, the production and distribution of semi-finished and finished products, to final consumption and recycling.

STI is the process of creating new products and services or improving existing ones through the introduction of new scientific knowledge, technologies and methods^[4]. It has important implications for the social, economic and scientific spheres.

Quality chain risk immunization refers to the ability of an enterprise to improve its ability to resist and overcome risks by adopting effective measures and coping strategies in the face of various potential risks in the quality chain. It emphasizes the flexibility, adaptability and responsiveness that enterprises should have in quality chain management.

Science, technology and innovation have an important impact on the immunization of risks in the quality chain. First, the application of IoT technology allows companies to monitor and track supply chain links in real time, improving the detectability and responsiveness of problems^[5]. Second, the development of big data analysis technology provides enterprises with better risk prediction and decision support. By analyzing huge amounts of data, enterprises can identify potential risk factors and conduct trend analysis and modeling to provide a basis for the development of appropriate risk management strategies^[6]. In addition, machine learning and automated algorithms assist in decision making and problem solving, helping to achieve a higher level of quality management and risk

control^[7].

3. Analysis of Problems and Causes of Science, Technology and Innovation

From a global value chain (GVC) perspective, there may be some problems with STI in quality chain risk management. These mainly include the following reasons:

Different countries and regions have different technical standards and norms in STI, which may lead to inconsistencies in technical standards in the value chain among multinational enterprises, increasing the quality chain risk^[8].

STI may lead to information asymmetry, where some firms may possess advanced scientific and technological knowledge and technology, while others may be at a disadvantage in accessing information, which may lead to poor information transfer and inaccurate risk assessment in the quality chain. STI brings complexity to supply chain relationships, and firms may deal with more suppliers and partners^[9], which increases the complexity and uncertainty of information flows and may lead to the proliferation of risks in the quality chain and make them difficult to manage. With the advancement of technology and innovation, data plays an increasingly important role in the quality chain, but data security and privacy issues are also becoming more prominent. Problems such as data leakage and information security vulnerability may bring serious risks to the quality chain. In the context of globalization, STI may bring the risk of technology transfer, and some enterprises may face the problem of technology theft or improper use, which may affect the stability and reliability of the quality chain.

In summary, although STI brings many opportunities and advantages for quality chain management, there are also some problems and challenges. Multinational enterprises need to find a balance between science and technology innovation and quality chain risk management, strengthen communication and cooperation, and establish an effective regulatory mechanism and risk management system in order to cope with the risk challenges at different levels and ensure the stability and sustainable development of the quality chain.

4. Analysis of Countermeasures to Address

Science, Technology and Innovation

Science, technology and innovation have brought new challenges and opportunities for risk immunization of the quality chain, which requires enterprises to take comprehensive measures in practice to strengthen quality management, ensure supply chain reliability, improve supply chain transparency, enhance market research and demand analysis, and adopt new technologies and modes in order to improve risk immunization and competitiveness of the quality chain. Specifically the following aspects:

Developing unified technical standards: Multinational enterprises can promote collaboration and information sharing among various links through the establishment of unified technical standards and specifications^[10], so as to reduce the risk of the quality chain caused by inconsistent technical standards. At the same time, strengthen communication with suppliers and partners to establish long-term and stable cooperative relationships.

Enhance information sharing and transparency: Technological innovation may lead to the problem of information asymmetry. Enterprises can reduce the risk of information asymmetry by enhancing information sharing and transparency, establishing a more open information platform, and facilitating the flow of information among all parties.

Establishment of supply chain risk management system: In response to the complexity of supply chain relationships, enterprises can establish a perfect supply chain risk management system, including the establishment of a risk assessment mechanism^[11], the establishment of contingency plans, the strengthening of supplier audits, and other measures, to improve the identification of supply chain risks and the ability to respond to them.

Strengthening data security protection: Facing the problem of data security and privacy, enterprises should strengthen data security protection measures, including encrypting data transmission, establishing a strict permission management system, conducting regular data security audits, and other measures to ensure the security and confidentiality of data in the quality chain.

Strengthening technology protection and intellectual property management: In response

to the risk of technology transfer, enterprises can strengthen intellectual property management, including measures such as strengthening technology protection, signing confidentiality agreements, and enhancing employee training, to ensure that their core technologies and intellectual property rights are not infringed upon^[12].

Overall, when facing the challenges of STI and quality chain risks, enterprises need to consider various factors, take comprehensive countermeasures, and strengthen internal management and external collaboration in order to ensure the stability and sustainable development of the quality chain. In this way, they can better utilize the opportunities brought about by STI while effectively

5. Conclusions and Inspiration

The impact of STI on risk immunization of the quality chain is twofold, bringing new opportunities as well as new challenges. Science and technology innovation is an important force driving the upgrading and transformation of the quality chain. Enterprises need to actively adopt new technologies and modes to improve production efficiency and quality levels in order to maintain competitive advantages. Strengthening quality management and supply chain management, as well as establishing a sound quality traceability and feedback mechanism, will continuously improve the risk immunity and competitiveness of the quality chain.

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