

Influencing Factors of Inherent Immunity in Supply Chain Quality Management of Manufacturing Industry

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Abstract: Supply chain quality management is the lifeblood of modern manufacturing enterprises. Quality issues are related to the long-term competitiveness of the manufacturing industry and the trust of end consumers, and mastering quality management is the only way to stand out in the fierce flood of the globalised market and cast a good brand of Made in China. Based on immunity theory, this study compares the corresponding literature on supply chain quality management, enriches the framework of influencing factors of inherent immunity in manufacturing supply chain quality management, and provides some reference and inspiration to the current research on the combination of immunity and supply chain quality management.

1. Introduction

Immunity originates from the field of biology and is a complex system of biological organism itself. With the further development of scientific research, immune theory has been enriched and developed, immune culture has been closely combined with research in various fields, and the role of immunity has gradually played into great. The combination of immunity and manufacturing supply chain has been studied by a number of scholars, and now a relatively rich research result has been formed.

The supply chain, as an important idea and realisation path for the transformation of enterprises towards globalization, has turned from a traditional individual enterprise into a common collection of multiple enterprises, representing a new development model that helps enterprises to embark on the fast track of economy and quality. In the face of the dynamic changes in the operation of the supply chain system, product quality remains a key concern for consumers, enterprises themselves and their supply chain partners.

Compared with supply chains in other industries, manufacturing supply chains have characteristics such as lengthy, many nodes and extensive activities. In the context of the era when Chinese manufacturing goes to the global market, quality management of manufacturing supply chains is a problem that scholars and experts in related fields must take seriously to revitalise supply

chains, and through research, related scholars and experts have found that supply chain systems and biological immune systems are extremely similar in many aspects. Similarity, through further attempts, some research results can be produced and enriched, making outstanding contributions to the combination of quality management and immunization in the supply chain, but still lacking some comprehensive conditions in the aspect of enterprise practice, I believe that with the development of scientific theories and the enrichment of immunization disciplines. The results of the practice will yield great economic benefits and results.

This study takes manufacturing supply chain quality management as the research object and identifies the factors that influence its inherent immunity. Based on the relevant literature, the connotation and characteristics of supply chain quality management and related research are reviewed, the current status of the integration of manufacturing supply chain quality management and immunity culture is summarised, and finally the three main variables affecting inherent immunity in manufacturing supply chain quality management, namely supply chain system, supply chain culture and supply chain structure, are identified and their meanings are defined. The results of this study enrich the supply chain quality management inherent immunity.

2. Overview of Research

2.1. Supply Chain Quality Management (SCQM) Connotation and Characteristics

Supply chain quality management refers to the control of the quality of the relevant products within the scope of responsibility of the supply chain, from the production of the source, the design of the midway, and the final molding process, so that the quality of the products can be guaranteed. With the emergence of the supply chain management model, quality management has been transformed from a single enterprise management model to a collaborative activity of multiple enterprises in the supply chain.

Kuei and Madu (2002) define supply chain quality management (SCQM) in an interesting split: Supply chain (SC) refers to the entire network of products from the taking of raw materials to the sale of finished products; quality (Q) refers to the process of production of products in the context of changing market demand. Quality (Q) refers to the ability to make decisions about product sales plans, and to provide customers with high quality products and satisfactory services under changing market conditions; Management (M) refers to the management of work and activities to achieve the goal of strengthening the quality of the supply chain and to actively create the conditions for the production of high quality in the supply chain [1]. Thomas Foster (2008) saw supply chain Quality management is a systemic way of thinking that unifies upstream suppliers and downstream customers, and leverages the opportunities given by a unified upstream and downstream approach to collaborate and work together towards improving supply chain performance. Defining supply chain quality management as a system approach, the aim is to improve the performance of the supply chain and to obtain more opportunities by promoting the union of suppliers and customers, summarising the management activities related to supply chain quality management including quality measures management, supplier relationship management, leadership role management and so on[2]. Qian (2007) integrated the literature at home and abroad and concluded that supply chain quality management has broken through the shackles of "control" by a single enterprise to a new situation of "collaboration" between multiple enterprises. The partners in the supply chain face not only the direct customers, but also the final customer group, so they should analyse and solve the various problems in the supply chain quality management with systematic thinking, and the upstream and downstream should deal with the problems harmoniously and properly, and accomplish the goals in the management activities of planning, organising and coordinating [3]. From the perspective of the supply chain process, Pu et al. (2011) define it as a supply chain in

which all members of the supply chain face the customer group and use collaborative management tools to integrate the operational processes from upstream enterprises to downstream enterprises in order to ensure quality and thus continuously improve supply chain performance and maximise customer satisfaction [4].

In the context of the era of Big Data, supply chain quality management has been given a new meaning. In order to enhance the common interests of all enterprises in the supply chain and to maximise customer satisfaction with the products, all members upstream and downstream of the supply chain make full use of information technology tools to integrate, coordinate and control quality work, thus achieving the purpose of achieving quality with information.

In summary, supply chain quality management has the following characteristics compared with the traditional quality management in the past.

(1) Expanded management perspective, management activities from within the enterprise to external transformation, more attention to quality control measures.

(2) A comprehensive approach to management, the approach to supply chain management is more systematic, the quality objectives and specific measures need to be consistent, supply chain quality management is concerned with the structure of the supply chain, and the process of operation.

(3) The management object is more collaborative, supply chain quality management through the contractual approach, play the role of the core enterprise to guide, and establish links with other supply chain partners, binding the behaviour of all parties.

2.2. Research on Supply Chain Quality Management

Regarding the theory of supply chain quality management, different scholars have studied it from different perspectives. Focusing on the central role of business leaders, Cheng and Wen (2020) found that the core enterprises in the supply chain have significant differences in terms of the time period, type and operation links in the supply chain, and the key to determining the core enterprises is whether they have mastered the key technologies, methods and capabilities[5].The core enterprises must play a leading role in the quality management activities of the supply chain and take on a greater responsibility than other enterprises. By studying the quality management process, a sound research framework for management activities is proposed, and a management model and strategy for how to play a leadership role based on the leadership perspective of the core enterprise is proposed. Jiang and Zhong (2020) focused on six dimensions in the supply chain environment and established an evaluation index system on leadership, strategy, resources, process, continuous improvement, customers and market of the supply chain, based on the idea of PEM, and took a dairy company in Fujian as the object of their supply chain quality management evaluation study. A more comprehensive subindex system was established, which served as a reference to a large extent for subsequent evaluation studies [6]. Zhang et al. (2017) took a service supply chain jointly formed by an integrator and a provider as the research object [7], considered the influence of quality preference, divided quality management into two stages for control, proposed a hypothesis model, considered the model solution in different contexts, and concluded that service quality and service price had an impact on the optimal utility of the service supply chain. Jia et al. (2021), targeting dairy manufacturing and processing enterprises [8], analysed the maximum payoffs that all members of the supply chain are willing to make in order to improve quality under four scenarios of dairy quality management game based on the differential game research method, and compared the final payoffs of each enterprise under the four game scenarios.

Research methods in supply chain quality management are in an evolving stage, mainly in terms of the product life cycle, with sub-objective studies on cost, service, and different research methods

depending on the particular object. In reality, the supply chain is in a dynamic situation, where more than one aspect affects quality issues, and research into supply chain quality management is shifting towards dynamic change.

3. The Combination of Manufacturing Supply Chain Quality Management and Immune Culture

Supply chain quality management is in a dynamic external environment. As a complex system, the complexity of the supply chain is not only reflected in the quality management of products, the management of relationships with various partners, the impact of unexpected events, changes in market policies, which can have an impact on the supply chain system. An analogy between the supply chain system and the situation of an organism's immune system reveals that they have many similarities. Mimicking the immune system, a supply chain quality management system is established within the supply chain to safeguard product quality. Wang proposed the concept of organisational immunity, combining immunity and organisation for research, and elaborated on the functions, mechanisms and influencing factors of organisational immunity, which plays an important role in guiding the construction of an enterprise's immune system [9]. Subsequently, Li proposed the supply chain quality management immunity, defined it, analogized the immune system pathway of organisms, and divided the process of immunity into two types of inherent and acquired immunity [10,11]. The process of immune response is divided into four sub-processes: Recognition, learning, memory and effect. A conceptual model of supply chain quality management immunity is established, and the relevant research content and implementation methods of supply chain quality management system are described. For supply chain quality management immunity, Li's team from Jilin University continuously enriched the theory, and Zhao conducted an in-depth exploration of the transmission path of supply chain quality under immunity theory [12]. Firstly, the immunity theory is applied to analyse the structure of the internal supply chain immune system with reference to the lymphatic system and the complement system, to establish a research framework for the immune system of supply chain quality management, and to carry out in-depth optimisation of the organisational structure of nodal enterprises with a view to achieving the intended goal of immune management. Secondly, from the internal and external aspects of the supply chain, a dual perspective model of supply chain quality transmission and control is established, and the process of quality immunity transmission is studied in depth. Sun analogises supply chain quality management with biological immune systems at the level of network structure and network objectives, verifies the feasibility of applying immunity theory to supply chain quality management, and discusses its boundaries, characteristics and operation mechanism [13]. The relationship between supply chain quality management and supply chain product quality performance based on acquired and inherent immunity is proposed, and it is argued that quality culture and quality resources are the specific paths to achieve the results of the immune function of supply chain quality management, and the dimensions of quality immunity are distinguished. It provides a reference for enterprises in the supply chain to build an immune system and thus improve their quality performance.

In summary, supply chain quality management from an immunization perspective has the following characteristics compared to previous traditional quality management.

(1) Dynamicity. The most important feature of the immune system is that it is in a dynamic environment, and the supply chain quality management immune system also has the same characteristics.

(2) Openness. For the supply chain quality management immune system, in many aspects with the environment is very dependent, in the process of interaction with external resources, to maintain a stronger openness, and constantly achieve system innovation.

(3) Learning. The stronger the learning ability, the quicker the response to the market, reducing the negative impact of unexpected events on the system.

4. Identification of Influencing Factors of Inherent Immunity of Supply Chain Quality Management

4.1. Inherent Immunity of Supply Chain Quality Management

The immune response of an organism is the main way for the immune system of the organism to play its immune role and destroy diseased cells. The intrinsic response is innate in the organism, mainly acquired through genetic inheritance, and allows for a rapid response to viruses that invade the organism, destroying the physiological structure of the virus and thus ensuring the health of the organism. The intrinsic response of the supply chain quality immune system is established with reference to the intrinsic immune response (non-specific immune response) of the organism.

As the supply chain evolves from simple to complex, the number of responses to the inherent immunity will increase, and the immunity will be deepened and gradually improved, which is created and established along with the growth of the enterprise. The main expression is the quality culture of the company, culture is the base of a company, will not be easily changed. It is a system consisting of core values, codes of conduct, that is slowly given to a group organisation at the beginning of its establishment. Supply chain quality management inherent immunity of the identification process, performance outside, the supply chain of internal and external disturbance of unsafe factors, the supply chain quality management system, will consciously according to the occurrence of prior to the requirements of the quality culture to make processing, if consistent, will allow such specific events, if not, will immediately call the relevant people and organizations, the harmful events to remove, to avoid its If it does not, the relevant people and organisations are immediately called in and the harmful event is removed to prevent it from entering the supply chain system and causing damage to quality.

The behaviour of the intrinsic immune response can be summarised in three processes [10,14]: (1) The exposure process, in which those involved in supply chain quality management come into direct contact with the target event and discover its presence through their participation in supply chain management activities. (2) Identification process, through contact, members of supply chain quality management understand the characteristics of the target event, judge its good or bad, and decide whether to remove it based on quality culture guidelines. (3) Response process, based on the determination of the previous process, events that are consistent with the quality culture are allowed to remain, and things that are not consistent with the quality culture are cleared. Managers take timely management action to control what is happening.

4.2. Identification of Influencing Factors

The inherent immunity system of supply chain quality management, as the first line of defence against quality immunity, has a wide range of action, high stability and hereditary stability. Quality culture is part of corporate culture, and supply chain quality culture is an organic combination of the quality cultures of member companies in the supply chain. The level of inherent immunity in supply chain quality management is directly influenced by the supply chain quality culture. At the same time, inherent immunity is also influenced by other factors, which are summarised as the following three first-level influencing factors.

(1) Supply chain system: The effectiveness of the quality management system, the transparency of the system, the completeness of the system construction, the system to achieve a rule to follow, in order to be able to encounter some target events, there is a basis for how to deal with. For example: In the collection of raw materials in the manufacturing supply chain to increase the transparency of the investment system can avoid the situation of pulling strings.

(2) Supply chain culture: Whether the members of the supply chain have the spirit of solidarity and cooperation, whether they can maintain the same value orientation, the size of the awareness of quality norms, the level of morality of employees, the weakness of the legal concept, all have an important impact on the generation of inherent immunity. For example, a supply chain system with a strong awareness of quality norms will have a high level of intrinsic immunity, and the process of responding to target events will be accelerated to avoid causing greater losses for the supply chain system.

(3) Supply chain structure: The behaviour and quality of the manager has a subtle influence on the code of conduct of the staff, as the core figure of management, the team structure of the supply chain must be clear, the smooth flow of information technology, the choice of management level, the staff and managerial authority is divided, suitable supply chain structure, the inherent immune response process will be smooth, the event to reflect on the target event will be greatly shortened, the elimination of abnormal events operation will save more resources. For example: For the manufacturing supply chain of raw materials suddenly failed, and managers and related personnel on the communication fluent, will save human resources to find new raw materials, to ensure that the supply chain quality management immune system to make a response.

5. Summary and Prospects

This study firstly defines the connotation and concept of supply chain quality management, analyses the current research methods and research hotspots of supply chain quality management, and compares the advantages of supply chain quality management and traditional quality. Secondly, the combination of supply chain quality management and immunization is explained, the advantages of supply chain quality management immunization are discussed, the concept and process of action of intrinsic immunity is taken as the entry point, and finally three influencing factors of intrinsic immunity are proposed. In this study, the research on supply chain quality management immunization is still on a qualitative basis, and the quantitative treatment of the influencing factors has not been further developed. In the subsequent research, we will focus on this aspect and carry out research in the form of empirical analysis to obtain quantitative data, explore the mechanism and degree of influence of the influencing factors, and enhance the practicality of supply chain quality management immunization.

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