The Dynamics of Brand Strategy

for Food Safety and Quality in Food Supply Chain

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The first part of this article explains the closed loop and assumptions of the branded food supply chain (BFSC), thus giving the basic model of BFSC. This paper takes Chives from Tianjin Quebao Supermarket Company (TQSC) in China as an example, using system dynamics modeling theory to construct a branded food supply chain (BFSC) system consisting of multiple suppliers, a single brand manufacturer and consumers. The simulation system will enable decision makers to formulate brand strategies to deal with complex changes. Upstream suppliers who determine food quality cannot directly benefit from quality improvement, and core brand manufacturers who benefit from quality improvement cannot directly determine product quality, which brings many food safety and quality issues.

Based on the above, the following assumptions are proposed: (1) The end-consumer market demand is known and affected by food quality; (2) N suppliers, a single brand manufacturer and a single consumer are considered; (3) Single brand item is considered; (4) Raw materials to finished goods factor is 1:1; (4) Raw materials equally distributed among N suppliers; (5) Food quality mainly depends on the quality of raw materials from suppliers; (6) Consumer's desired food quality determines the brand value of food product; (7) The purchasing price of raw materials is determined by the core actor manufacturer and constant.

The second part uses Vensim PLP 8.09 to demonstrate the multi-supplier game modeling and simulation. It describes the SD behavior of raw material suppliers from high-quality to low-quality, following the following point of view: brand value is determined by differences in the entire supply chain The total added value created by the participants ultimately depends on the willingness of the final consumer to pay. It explains the inverse relationship between the quality of raw materials and the number of suppliers, that is, as the number of suppliers increases, the quality of raw materials also decreases. The materials provided by suppliers are decreasing. The results show that food quality is not only determined by a single supplier, but also by all suppliers. When the number of suppliers increases, their chosen behavior will fall into a prisoner's dilemma.

The third part proposes the modeling and simulation of the brand value of manufacturers and consumers, including aspects: the food quality of the manufacturer and the brand value of the manufacturer and the consumer, which shows that Under the adjustment of satisfaction, the quality of food has become higher and higher, and gradually, consumers have better and better understanding of food quality and brand value, and the brand value of manufacturers has grown faster and faster. The brand value of BFSC depends on the final consumer's willingness to pay and is positively correlated with consumer expectations. The result is that the higher the consumer's expectations, the stronger the purchasing power, the market demand, and the greater the profits of the entire supply chain, especially The greater the profit of the core manufacturer.

The fourth part proposes the revenue sharing modeling and simulation of the supply chain. By comparing the revenue model of the supply chain with decentralized decision-making and the revenue sharing model of the centralized decision-making, it is concluded that with the improvement of quality, the centralized decision-making supply chain The revenue is always greater than the revenue of the decentralized decision-making supply chain, and it grows faster, and the quality is improved. At the same time, considering the special characteristics in order to improve the quality of raw materials, thereby improving the quality of food, the total revenue of the centralized decision-making supply chain is shared by suppliers and manufacturers. Whether it is a supplier or a manufacturer, the shared revenue of centralized decision-making is higher than that of decentralized decision-making. In addition, revenue sharing can encourage suppliers to improve the quality of raw materials, and it can also encourage manufacturers to strengthen brand building.

The fifth part introduces the conclusions and limitations of this work and possible future research. The food supply chain can adopt a decentralized or centralized decision-making model. For many small-stakeholder suppliers, if they choose a decentralized decision-making model, they may choose to free ride and reduce the quality of raw materials. On the other hand, although the centralized decision-making model is more conducive to increasing the income of the food supply chain than the decentralized model, it is not feasible to improve the quality of raw materials due to the small supplier scale. However, the strategy of sharing brand revenue can provide solutions for improving quality and increasing the revenue of the entire food supply chain. In addition, manufacturers increase revenue faster than suppliers and remain the biggest beneficiaries.

This model also has several limitations. First, the model may be more accessible, but some of its parameters and their value ranges need to be adjusted to be more realistic. The second limitation is that the definition of the initial value in the inventory equation needs to be further adjusted. The third restriction involves policy analysis in the supply chain revenue sharing model, which requires sensitivity analysis to propose quality improvement strategies.

This model provides some extensible foundations. Of course, the above restrictions should be resolved first. In addition, the sustainable development of the branded food supply chain deserves further exploration and simulation to guide more food companies to grow bigger and stronger, build brands, and ensure food safety. On the other hand, in terms of the reality of China's rural areas, branded food companies should be encouraged to develop large-scale suppliers (such as family farming) to improve their supply chains by redesigning the organizational structure.

Figures:



Fig.1. The Closed-loop of branded food supply chain (BFSC) (solid lines denote direct relationship, dashed lines denote inverse relationship)



Fig.2. The stock-flow diagram of multi-supplier model







Fig. 4. The dynamics behavior of suppliers choosing to provide low-quality materials



Fig.5. The comparison diagram of the QCR and the SLQ with the increase of N



Fig. 6. The dynamics behavior of suppliers providing materials from high to low quality



Fig.7. The stock-flow diagram of manufacturer food quality model











Fig.10. The stock-flow diagram of manufacturer & consumer brand value model



Fig.11. The dynamics behavior of IQM with the increase of the λ value



and PIC with the increase of the θ value





Fig.13. The oscillation behavior of third-information delay from IVM to IQM

Fig.14. The oscillation behavior of third-information delay from BIE to IQM



Fig.15. The stock-flow diagram of supply chain brand revenue sharing model







Fig.18. The SD behavior of suppliers and manufacturer with revenue sharing or not



Fig.17. The SD behavior of the decentralized and centralized with the ζ value's increase



Fig.19. The SD behavior of suppliers and manufacturer with the Ω value's increase