

**A CONCEPTUAL PROJECT REPORT ON “RISK MANAGEMENT IN
FOOD SUPPLY CHAIN”**

School of Logistics and Aviation Management

**Bachelor in Business Administration
(Logistics & Supply chain Management)**

By

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Certificate of Approval

The following Conceptual Project Report titled "Risk management in food supply chain" is hereby approved as a certified study in Supply Chain Management carried out and presented by **Harsh Rajput in** a manner satisfactory to warrant its acceptance as a prerequisite for the award of **Bachelor of Business Administration in Logistics & Supply chain Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the Conceptual Project Report only for the purpose it is submitted to the Conceptual Project Report Examination Committee of the Galgotias University for evaluation of Conceptual Project.

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Abstract

Evaluating the quality risk level in the food supply chain can reduce quality information asymmetry and food quality incidents and promote nationally integrated regulations for food quality. In order to evaluate it, a quality risk evaluation indicator system for the food supply chain is constructed based on an extensive literature review in this paper. Furthermore, a mathematical model based on the fuzzy comprehensive evaluation model (FCEM) and failure mode, effects, and criticality analysis (FMECA) for evaluating the quality risk level in the food supply chain is developed. A computational experiment aimed at verifying the effectiveness and feasibility of this proposed model is conducted on the basis of a questionnaire survey. The results suggest that this model can be used as a general guideline to assess the quality risk level in the food supply chain and achieve the most important objective of providing a reference for the public and private sectors when making decisions on food quality management.

1.

INTRODUCTION

Supply

chain risk management (SCRM) can be defined as 'the management of supply chain risks through coordination or collaboration among the supply chain partners so as to ensure profitability and

continuity. Supply chain risk may result from unexpected variations in capacity constraints, or from breakdowns, quality problems, fires or even natural disasters at the supplier end (Blackhurst et al. 2005, Yang and Yang, 2010). A failure of any one element in a supply chain potentially causes disruptions for all partnering companies upstream and downstream (Yang and Yang, 2010). For example, the leading telecom company Ericsson was affected seriously by a fire at one of its suppliers. (Wall Street Journal, 2001).

The vulnerability of a supply chain increases with increasing uncertainty (Svensson, 2000), and it increases even further if companies, by outsourcing, have become dependent on other organizations. The greater uncertainties in supply and demand, increasing globalization of the market, shorter and shorter product and technology life cycles, and the increased use OF manufacturing, distribution and logistics partners resulting in complex international supply network relationships have led to increased exposure to risks in the supply chain.

Food quality is defined as the access of all people to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Food quality covers a broad area that can be characterized by a set of different risk factors, such as the agricultural conditions, production process, use of antimicrobials, and consumer demand. These factors can be represented by various indicators such as environmental pollution, microbial contamination, logistics, warehousing, and transportation. The risk indicators are related to the food supply chain processes and can be evaluated and documented on the basis of

imprecise inputs.

Quality Risk Evaluation Indicator System for the Food Supply Chain

To ensure the accuracy and effectiveness, a quality risk evaluation indicator system that covers the entirety of the food supply chain should

be established before evaluating food quality risk. Existing research on this system has been very limited. There is no ready-made quality risk evaluation indicator system for the food supply chain. Here, the effective approach to establishing the preliminary indicator framework is to analyze the existing literature and the laws and regulations of food safety regulatory. On this basis, the quality risk evaluation indicator system for the food supply chain can be built by the method which is based on the fuzzy analytic hierarchy process (FAHP) proposed by Wang et al.

Raw Material Supply Risk.

The risk of raw material supply involves the raw materials produced by human pollution, natural pollution, and other factors that lead to pesticide residues, pathogen pollution, and illegal additives during the process of planting or breeding, which results in long-term or short-term harm to human health. Raw material supply risk is a source of food quality risk, including soil pollution, air pollution, water pollution, heavy metal pollution, illegal use of additives, residual inputs, microbial contamination, pathogenic bacteria pollution, and transgenic technology risk.

Production and Processing Risk.

This risk arises when the safety management and production environment during the processes of production and packaging are not compliant with regulations; this risk could lead to possible food contamination and illegal additives and produce potential

safety hazards to human health. As this link involves the food quality and safety in the whole food industrial chain, its impact is relatively large. The main quality risk evaluation indicators included in this link are illegal use of additives, contamination with foreign matter, inability to wash a food product clean, presence of detergent residue, pathogen contamination, microbial contamination, uncertified processing equipment, non-standardized processing personnel operation, insufficient processing environment

Logistics,

Warehousing, and Transportation Risk

The logistics, warehousing, and transportation risk involves the raw food materials and finished products containing harmful substances or being subject to pollution or deterioration during the process of transport or storage, which results in the existence of potential safety hazards. In this paper, logistics, warehousing, and transportation includes both the process from the raw materials to production and the process from the finished product to consumption.

Sales and Consumption

Risk.

The sales and consumption risk involves food contamination, deterioration, and contamination with harmful substances due to expired shelf life, food fraud, improper sales environments, or improper consumption of food, which poses a potential hazard to human health. The quality risk evaluation indicators in this link include selling expired food, falsifying the date of production, false reporting of food

ingredients, poor sanitation in dining establishments, poor sanitation conditions, improper disposal of waste food, poor sanitation in cooking facilities, improper eating methods, and insufficient storage environment.

Government Regulatory Risk.

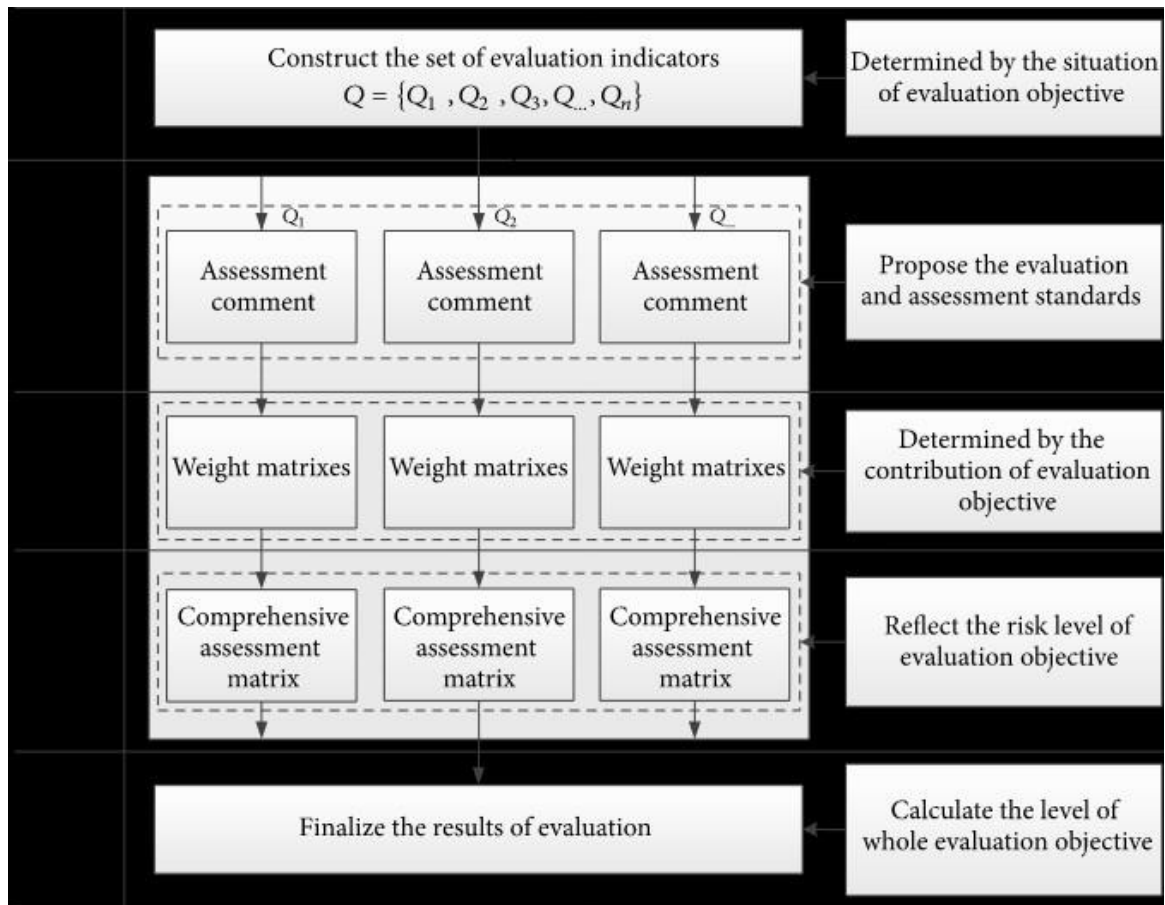
In the food industry, manufacturers may add chemical additives to augment the appearance or the taste of food. This process may increase food demand and sales profits but cause health problems among consumers. The government can take punitive measures to regulate such risky behavior and benefit from the tax income generated by the increased revenues arising from such additives. An analysis of the current status of China's food quality regulations reveals that the quality risk evaluation indicators regarding government regulation include imperfect regulatory system, supervisory staff level, supervisor moral hazard, supervision channels, regulatory organization regulatory, agency efficiency, regulatory process management, regulatory results feedback, and regulatory detection technology.

Evaluation Model

Fuzzy Comprehensive Evaluation Method

FCEM is a method based on the membership degree theory in fuzzy mathematics, which transform the qualitative evaluation into quantitative evaluation. It has now become an effective multifactor decision-making tool for comprehensive evaluation. Combined with experts grading method, FCEM can make a full reflection on the fuzziness of evaluation criteria and the influence

factors and produce evaluation results closer to the actual situation. The typical FCEM process could be shown in Figure-



Steps to Food

Reduce Risk.

has never been a more global market than it is today, and those who operate in the food supply chain are bound by the public's trust in spoken and unspoken ways. Customers are used to taking for granted that they can walk into a supermarket and walk out with ethically sourced fish and eggs free from E. coli worries.

Not every food product is, or can be, a global one. However, some of these domestic risk factors scale up, just as our businesses do. When the food supply chain crosses borders of any kind, the familiar health and food safety risks are joined by several others:

- Product mislabelling
- Unplanned-for natural disasters
- Spoilage due to any number of unforeseen circumstances
- Damage while in transit
- Unpredictable politics and shifts in regulations

A food company's supply chain can be the weakest link in their food safety program. Rockville, MD In all honesty, no list will ever encompass the scope of the risk you take on as part of the global food supply chain. That's not to say you can't take steps to reduce your risk—sometimes several

types of risk at once—as your operation grows. The following is a look at several practical suggestions, some of them more time-intensive and perhaps cost-prohibitive than others, but all worth a look as the world grapples with globalization in the food industry.

1. Don't Take Company Culture or Employee Training for Granted

Working safely and conscientiously in a particular trade is not knowledge we're born with. When you consider the fact that at some level every food product we bring into our homes was handled at one point by another human being, you get a sense of the role proper training and a healthy culture can play in the safety we expect of our food.

Among recently surveyed manufacturers in the global food space, 77% of them said globalization itself was a source of risk. It's easy to see why. In 2015, a relatively small—though still deadly—Listeria outbreak was traced to just a few Blue Bell Ice Cream factories. The company was almost ruined by the three deaths, the illnesses and the nearly crushing reputational damage.

Use Predictive Sales Forecasts and Intelligent Logistics to Avoid Spoilage

Unnecessary food waste and spoilage emerged as a mainstream issue in recent years all across the globe. For example, citizens in the EU are forced to discard some 89 million tons of food each year due to overstocking, poor quality control and a lack of attention paid to consumer trends. The United States throws out 35 million tons of food for the same reasons—a problem that, billed collectively, carries a price tag of \$165 billion each year in the United States alone.

The solution has arrived in the form of predictive analytics and more intelligent warehouse and inventory management systems. Domestic and global supply chain partners alike now have access to, in some cases, highly customizable software systems that can provide vital data, such as:

-Ideal stock levels for perishable items

Constant checks on incoming versus outgoing products

Intelligent insights into customer behavior patterns and near-future buying patterns

Take Packaging More Seriously

Many of us don't give packaging a second thought. So long as it's easy to get into, eye-catching and protects the product long enough for the consumer to get their hands on it, it's

good enough — right? Not quite. When manufacturers think about packaging as merely a branding matter rather than as a safety check, the price is sometimes human health and lives.

One obvious solution to make sure your products can travel as far as they need to is to invest in vacuum packaging, even for small-scale operations. Compressed air equipment is a highly affordable way to accomplish this. The USDA and CDC provide guidelines on modified atmosphere packaging (MAP) and controlled atmosphere packaging (CAP).

Packaging material requirements are a global concern as well as a domestic one. The EU provides guidelines for packaging materials that are detailed down to the type of ink used. Knowing about the laws in your sales territories and staying aware of new breakthroughs in material sciences can help you remain in compliance and ahead of the game.

Stay Abreast of Changing Regulations

American politics might be volatile, but one thing that isn't likely to change is that consumers tend to look toward institutions like the FDA to provide updated guidelines and to pursue strong, consumer-friendly legislation. That means compliance isn't always a choice, but it also means you have the opportunity to anticipate change and mitigate risks faster than your peers.

A recent example is FSMA. It's had a long rollout, with plenty of advance warning for the industries it touches, but now most of its rules have reached the implementation stage. This

lead time has been advantageous given the scope of the anticipated laws because it's given food processing companies time to prepare for compliance. In fact, globalization lies at the very heart of it.

Use Data to Build Greater Transparency

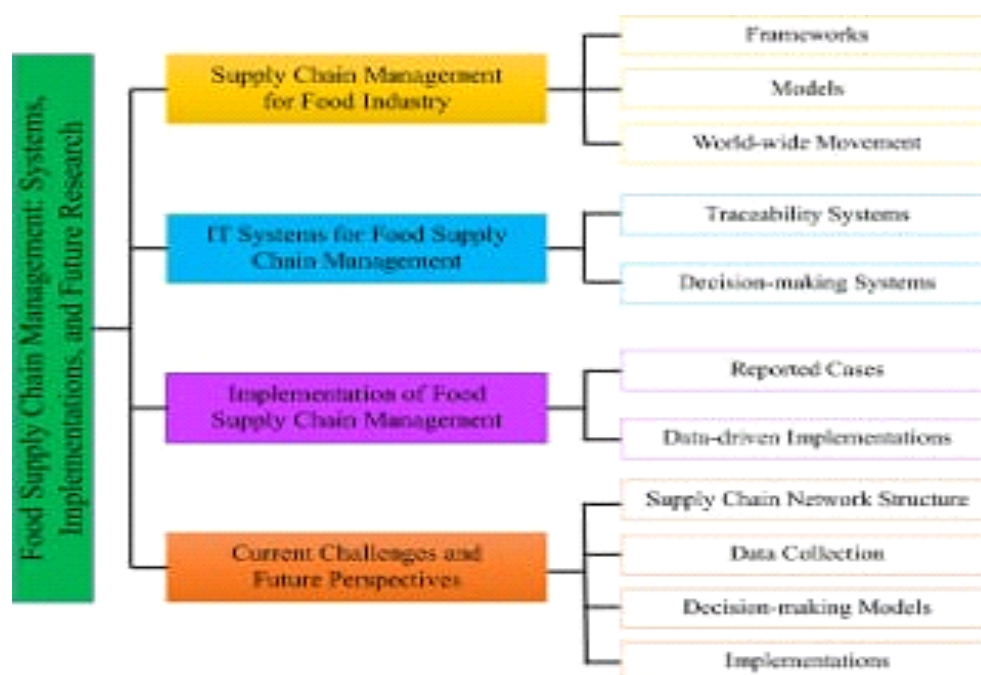
There has perhaps never been a more important time to take transparency seriously in the global food supply chain. As of this writing, a historically significant outbreak of E. coli among romaine lettuce products is closing in on an "all clear" from the CDC after two difficult months. By the time you read this article it's entirely possible another outbreak of a different kind might be underway or that some product or another has found itself under a recall. The possibility of reputational damage is greater than ever.

The good news is, even when the unfortunate happens, it's possible to greatly reduce risk to your brand and your customers' health. However, you need the tools to help you move quickly in tracing the problem.

Vigilance and Technology in the Food Industry

The stakes in the food industry are high, as we've seen. However, with the right combination of a cultural approach to safety, a mindfulness of changing regulations and the sensible application of technology so you can act on the data

you're gathering, you'll be in a prime position for global success in this quickly changing field.



FOOD SUPPLY CHAIN MANAGEMENT IMPLEMENTATION AND RESEARCH

As the increasing awareness of food quality, safety, and freshness, FSCM is facing ever pressure to meet these requirements. How to upgrade and transform current FSCM to suit the ever increasing demands in the future? This paper presents a state-of-the-art review in FSCM from systems, implementations, and worldwide movements. Current

challenges and future perspectives from supply chain network structure, data collection, decision-making models, and implementations are highlighted.

Based on the reviewed papers, some ideas and observations are significant for academia and industrial practitioners:

Advanced technologies like Big Data Analytics, Cloud Computing, and IoT will be employed to transforming and upgrading FSCM to a smart future;

Data-driven decision-makings for FSCM would be adopted for achieving more sustainable and adaptive food supply chain; and

FSCM implementations will be facilitated by the cutting-edge technologies-enabled solutions with more user friendliness and customization.

Accidents and Interruptions Are Major Food Supply Chain Challenges.

The biggest causes of monetary loss in the food supply chain are disasters like hurricanes, fires, and floods. There is relatively little a logistics coordinator or manager can do to ward off losses from disasters like these except have a plan to secure warehouses and vehicles against disaster scenarios and ensure the company has comprehensive insurance.

Improper Handling

A lack of attention can cause food to be stored at improper temperatures or can cause the recording of temperatures to lapse. Whether the food is spoiled or not, lack of proper records is cause to discard the product.

Fraud:

The food supply chain is complex and interconnected, with meats, produce, dairy, eggs, and more changing hands several times before they arrive for distribution. This opens up the possibility of adulteration and the substitution of inferior ingredients, as the 2013 European horsemeat scandal illustrates

Debris-

In the warehouse, trash can get caught in machinery, and large debris under a wheel can even cause a forklift to tilt and lose a load. This can cause the loss of entire load-level units of product and may require expensive maintenance.

Employee Injury:

Sharp debris like splinters and loose nails can cut and puncture flesh, taking employees out of the labor pool for days or longer. Another potential source of injury is injured backs and crushed toes. These may occur when workers handle heavy equipment like pallets manually.

Platform Failure:

Load-level equipment failure in which the pallet actually fails under strain can also cause injury, equipment damage, and the loss of product, and it often requires workers to temporarily halt logistic work until it is corrected.

In order to prevent these issues in the warehouse, logistics coordinators at every level should identify the weak spots in their food supply chains and focus on building practices into the process to eliminate them. A few of these solutions are:

Ensuring that employees are properly trained to log temperatures and that the logging process is intuitive, simple to follow, and employees understand the importance of compliance.

Implementing detailed tracking and tracing at the load level in order to reduce the opportunity for fraud.

Switching to a lighter weight and more durable shipping platform like a plastic pallet to eliminate wood debris and employee injury from handling heavy wood platforms.

Conclusion

The food industry is facing various challenges, including but not limited to reducing food waste, improving food quality and safety, and becoming more eco friendly. To address these challenges and improve the food quality, it is critical to implement efficient and effective quality and operations management measures by identifying food quality risk factors and evaluating the risk levels of each link in the food supply chain. This study adopted a comprehensive approach to establish a fuzzy evaluation model for food quality risk evaluation. Then, the methods of FCEM and FMECA were applied based on surveys of experts to evaluate the food quality risk level. The results of a computational experiment suggest that this approach is reasonable for evaluating the food quality risk level.