Identifying and Assessing Supply Chain Risks in Food and Beverage Companies in Bangladesh

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Abstract

The food and beverage industry in Bangladesh, a critically vital sector for the national economy, was subjected to a comprehensive examination aimed at addressing its inherent and persistent supply chain risks. This study focused on meticulously identifying and analyzing key vulnerabilities that specifically afflict this dynamic industry, encompassing prevalent climatic disruptions, persistent logistical inefficiencies, and pervasive economic instabilities. The research specifically aimed to understand how these multifaceted risks directly translate into operational challenges for businesses within this sector.

To achieve a holistic understanding, a robust mixed-method approach was diligently employed, integrating qualitative insights derived from in-depth content and thematic analysis of secondary data, with quantitative analyses obtained from statistical examinations of relevant economic indicators and industry reports. Data was meticulously gathered from a diverse and credible range of sources, including authoritative industry professionals, comprehensive governmental reports, alongside existing academic literature and scholarly articles. This rigorous methodology ensured a comprehensive evaluation of the sector's multifaceted supply chain challenges, allowing for a nuanced exploration of both the qualitative impact and quantitative trends of the identified risks.

The detailed findings consistently highlighted climatic events as the most severe and pervasive risk, frequently leading to widespread raw material shortages, significant production halts, and severe disruptions in agricultural output. This paramount risk was closely followed by prevalent infrastructural deficits, particularly in transportation networks and storage facilities, that consistently hinder timely distribution and increase logistical costs, and persistent financial volatility which collectively disrupted broader supply chain stability and substantially increased operational expenditures for businesses. Encouragingly, companies that proactively adopted various strategic mitigation measures, such as diversifying their sourcing channels and implementing robust inventory buffering techniques, consistently demonstrated higher resilience and more effectively maintained operational continuity. The study ultimately concluded that a concerted effort towards strengthening critical infrastructure, enhancing supportive policy frameworks, and rigorously adopting data-driven risk management strategies are unequivocally essential to safeguarding the sector's supply chains, ensuring long-term stability, and upholding food security across Bangladesh. This research provides actionable insights for policymakers, businesses, and researchers to foster a more resilient and sustainable food supply chain.

Keywords/tags (subjects)

Supply chain risks, food and beverage industry, Bangladesh, climatic disruptions, logistical inefficiencies, economic instability, risk mitigation.

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1 Introduction

The food and beverage industry in Bangladesh is one of the main pillars of the country's economy, with job creation and a major contribution to the nation's gross domestic product (GDP). However, the industry is faced with numerous supply chain risks that can potentially disrupt business operations, affect profitability, and undermine food security. Identification and assessment of these risks are essential in the development of proper mitigation strategies and building resilience in the sector (Rubinyi,2022).

Geographic location of Bangladesh makes it extremely susceptible to climatic problems such as floods, cyclones, and sea level rise. All these climatic events pose glaring threats to crops that are the backbone of food and beverage businesses (Kulp,2019). For instance, increased salinity caused by sea level rise adversely affects paddy cultivation, which is Bangladesh's staple food. In addition, climatic catastrophes have the likelihood of impacting movement and supply logistics, thereby causing traffic in supply chains. Bangladesh's vulnerability to climate change places greater emphasis on efficient risk assessment tools in the food and beverages sector (Ahmed,2021).

The globalized character of supply chains guarantees that economic and geopolitical events can have ripple effects on domestic industries. For neighbouring nations, export prohibitions provide incentives for smuggling and illicit trade practices, destabilizing domestic markets. A case in point is the rise in barter smuggling between India and Bangladesh, where gold is exchanged for essential commodities like sugar and grain, bypassing official trade channels and affecting domestic producers (Rahman,2024). These activities not just distort market prices but also make supply chain planning and inventory uncertain. Economic policy decisions in adjacent countries can have unexpected effects on Bangladesh's food supply chain. India's bans on exports from mid-2022 have given rise to a boom of barter smuggling from India to Bangladesh, where gold is being bartered for indispensable goods like sugar and grain. Such illegal trade bypasses appropriate channels, disrupts domestic markets, and generates uncertainties in supply chain management and inventory planning.

Exploitation of labour is an important problem for global supply chains, and Bangladesh is not the exception. Global retailers' cold race to the bottom in wholesale prices has the tendency to end up in workers' exploitation in developing countries. In shrimp aquaculture, for instance, workers are exposed to hazardous work conditions, substandard wages, and job insecurity. The exploitation not only raises ethical issues but also endangers supply chain stability, as labour unrest would lead to production halts and damage to reputation for the firms (Islam,2022). Labour exploitation continues to be an important issue in food supply chains in Bangladesh. In accordance with research, Bengal's aggressive pursuit by huge Western supermarkets for low wholesale prices hastened the exploitation of shrimp farmers and workers in countries such as Bangladesh. Workers are likely to suffer from hazardous working environments, low wages, and job insecurity, leading to production shutdowns and image loss for companies involved (Dhareshwar, C. (2018)).

A lack of transparency and traceability in supply chains can lead to severe operation risks. In the seafood industry, obscure supply chains have enabled activities like forced labour and un-controlled fishing to become prevalent, putting trillions of assets at risk. Such obscurity hinders swift reaction to disruptions and erodes consumer confidence. Electronic traceability systems have the potential to enhance transparency, but issues persist, such as the reliance on paper records and limited penetration of the Internet (Khamoushi, E. (2024)).

The Rana Plaza building collapse in 2013, which contained several garment factories, was a sign of the dire price of ignoring building safety and regulatory concerns in Bangladesh. Although the disaster occurred in the garment industry, it should be an eye-opener to the food and beverage sector in following safety precautions in a bid to prevent such tragedies. Ensuring structural stability and compliance with safety standards is paramount to protect workers and facilitate uninterrupted operations (Rajinikanth, A. (2020)).

The COVID-19 outbreak exposed weaknesses in Bangladesh's food supply network. Research on the retail food and beverage industry revealed that pandemic business management is greatly impacted by supply chain performance, efficiency, response, quality, and facility management. Pandemic disruptions led to increased costs for sourcing, transportation, and managing inventory, which emphasized the role of supply chain resilience strategies (Mitchell,2022).

The Bangladesh food and beverage industry operates in a complex supply chain risk landscape that includes environmental, economic, ethical, and operational risks. It needs an integrated approach to identify and assess such risks to facilitate effective mitigation. This involves not just mitigation of existing threats but also the provision of long-term resilience through sustainable processes, technology, and robust regulatory frameworks. Through pro-active mitigation of supply chain risk, the food and beverage sector in Bangladesh can enhance competitive-ness and improve national food security.

These issues must be resolved through a comprehensive strategy which includes the production of flood-proof crop varieties, regulation system empowerment to combat unlawful trade, cultivation of ethical workplace practices, and supply chain infrastructural investment with the aim of lessening work interruptions.

1.1 Background Overview

The food and beverage industry in Bangladesh is a significant sector of the economy of the country and continues to be a source of large-scale employment and GDP. In 2017, the industry was valued at approximately $4.5 billion and had exports valued at approximately $700 million, which were primarily of shrimp and fish items. The food processing industry alone accounts for over 22% of the country's industrial output and provides employment to over 20% of the population, reflecting the industry's economic importance (Silva,2013).

Despite its economic significance, the industry is fraught with several supply chain weaknesses that threaten its stability and growth. Among them is the scarcity of raw materials, which was one of the main propellants of activities for the next two years, as indicated by 39% of the firms. its scarcity will lead to production delays, increased costs, and reduced competitiveness in the domestic as well as international marketplaces (Alam,2024).

Disruption of energy and services are the other risks with 37% of companies concerned with disruption. Disruptions can halt production processes, make perishable items spoil, and lead to financial losses.

Exploitation of labour is an ongoing problem, particularly in sectors like shrimp farming. There are allegations that the exploitation of shrimp farmers and laborers in nations like Bangladesh has been facilitated by the large Western retailers' zealous pursuit of low wholesale prices.

Farmers and workers are likely to be exposed to hazardous conditions, low wages, and job in-security, raising ethical concerns and supply chain disruptions.

1.2 Research Aim

The aim of the study is to identify and assess different supply chain risks which are experienced by the food and beverage enterprises set up in Bangladesh.

Analyze the impact: Determine how these hazards may affect business operations, financial stability, and the overall effectiveness of the supply chain in the food and beverage industry in Bangladesh.

Analyze the tactics being used: Examine the efficacy of the risk management techniques currently used by companies in the sector.

Provide mitigation strategies: Create and suggest a strong framework of best practices and strategic mitigation strategies aimed at bolstering the food and beverage supply chain's ethical integrity, stability, and resilience in Bangladesh. This entails dealing with issues pertaining to logistics, the climate, economic uncertainty, and morality.

1.3 Research Objectives

The research objectives of this study are systematically structured to address key dimensions of supply chain risks in Bangladesh’s food and beverage industry:

1. To investigate the influence of the supply chain within the beverage and food organizations.

2. To achieve different risks in the supply chain faced by beverage and food companies in Bangladesh.

3. To analyze the negative effects of the identified risks in the food and Bangladeshi food and beverage firms.

4. To suggest the right action for resolving the problem of risk in the supply chain of food and beverage firms in Bangladesh.

1.4 Research Questions

1. What is the effect of the supply chain on the food and beverage firm?

2. What are the risks in the supply change to food and beverage firms operating in Bangladesh and What are the effects of the identified risks in the food and beverage companies in Bangladesh?

3. What are some of the right measures for addressing the problem of supply chain risks in food and beverage companies in Bangladesh?

1.5 Research Rationale

Numerous companies in the current world are capable of undergoing supply chain risk in business due to numerous reasons. Therefore, identifying such supply chain risks will enable food and beverage companies in Bangladesh to prevent or minimize unwanted situations that possess negative future impacts (Fahim et al., 2024). Companies operating in Bangladesh that try to export abroad can affect their supply chain impact, keep their reputation, and risk their financial position. They can have a continuous supply chain management system which won't be easily impacted. Such measures can be utilized by businesses in order to attain a competitive advantage through rendering them financially and reputational robust. It is further indicated that the supply chain threats faced by certain firms can be due to technological external threats such as cybercrime or natural risks such as natural disasters (Rauniyar et al., 2022). Certain types of cybersecurity attacks such as ransomware, malware, hacking and phishing attacks could result in the firm losing huge amounts while natural catastrophes such as geological activities impact the manufacturing operations. Supply chain risks enable companies that are based in Bangladesh to prevent disruptions as well as acquire information for strategy-making or identifying possible danger. Also, it enables food and

beverages companies to improve customer service in the domestic as well as overseas markets that are in accordance with customer requirements and expectations.

1.6 Ethical Consideration

Ethical issues in assessing risks in supply chains of Bangladesh's food and beverage industry are crucial to sustainability, equity, and consumer protection. Exploitation of labor is an issue in seafood and agriculture where workers face low wages, unfavorable working conditions, and job insecurity. Ethical sourcing and fair labor practices must be prioritized to uphold human rights.

Food safety and quality assurance also matter, as adulteration and contamination pose severe health risks. There is a need for companies to be transparent in ingredient sourcing, processing, and labeling to guarantee consumer protection.

Environmental sustainability is also a matter of concern on an ethical basis, with issues of over-exploitation of natural resources, loss of forests, and water pollution. Sustainable agriculture and sound waste management must be adopted.

Lastly, corporate social responsibility (CSR) must be integrated into supply chain planning so that businesses return value to society and mitigate risks. Ethical compliance fosters consumer trust and industry stability in the long run.

1.7 Problem Statement

The Bangladeshi food and beverage industry is plagued by many supply chain management problems, necessitating thorough research into the industry. The objective of this study is to examine key drivers of supply chain risk and offer effective solutions to mitigate them. In addition, supply chain management systems are crucial for Bangladeshi firms since they promote sustainable development through minimizing the environmental impact of food production. Further, these systems tighten the link between companies and their core suppliers, creating enhanced coordination and effectiveness.

1.8 Theoretical foundation and research tools

The study is mostly grounded in supply chain risk Management theory, which focuses on assessent, identification and mitigation of risk in the supply chain. The framework by Christopher and Peck (2004), which emphasises supply chain resilience through collaboration and flexibility, is particularly relevant. Additionally, stakeholder theory is mostly applied to evaluate the ethical dimension and the impact of supply chain decisions on community workers and consumers (Pimenta et al., 2022). The research tool used includes content analysis, which systematically interprets different qualitative data and uncover recurring themes and statistical trend analysis. This helps to identify patterns in supply chain description, which is based on secondary data. These tools help the comprehensive evaluation of risk categories such as operational, environmental, economic and ethical, impacting the beverage and food sector in Bangladesh. Furthermore, integrating disruption theory provides additional information related to how unpredictable events such as Geopolitical instability and climate change affect supply chain continuity. The study also considered the role of digital transformation in mitigating risk, highlighting how technology, is as blockchain and artificial intelligence, can increase resilience and traceability in beverage and food logistics.

1.9 Structure of the thesis

The thesis is mostly structured into five key chapters. Chapter one is an introduction which introduces the objective background, research question, rationale, and ethical considerations, also outlines the theoretical basis. Chapter two focuses on literature review and critically examines previous studies related to supply generation in the Bangladesh beverage food industry. Chapter three is methodology, which indicates details related to research design, philosophy, approach, data collection, data analysis techniques and limitations. Chapter five is data analysis and discussion represents thematic and statistical analysis, followed by findings of the discussion. The final chapter is a conclusion recommendation which summarises key findings, connects them to research objectives and provides proper recommendations and the future scope.

The structure and contents of the thesis work are explained in the picture below:

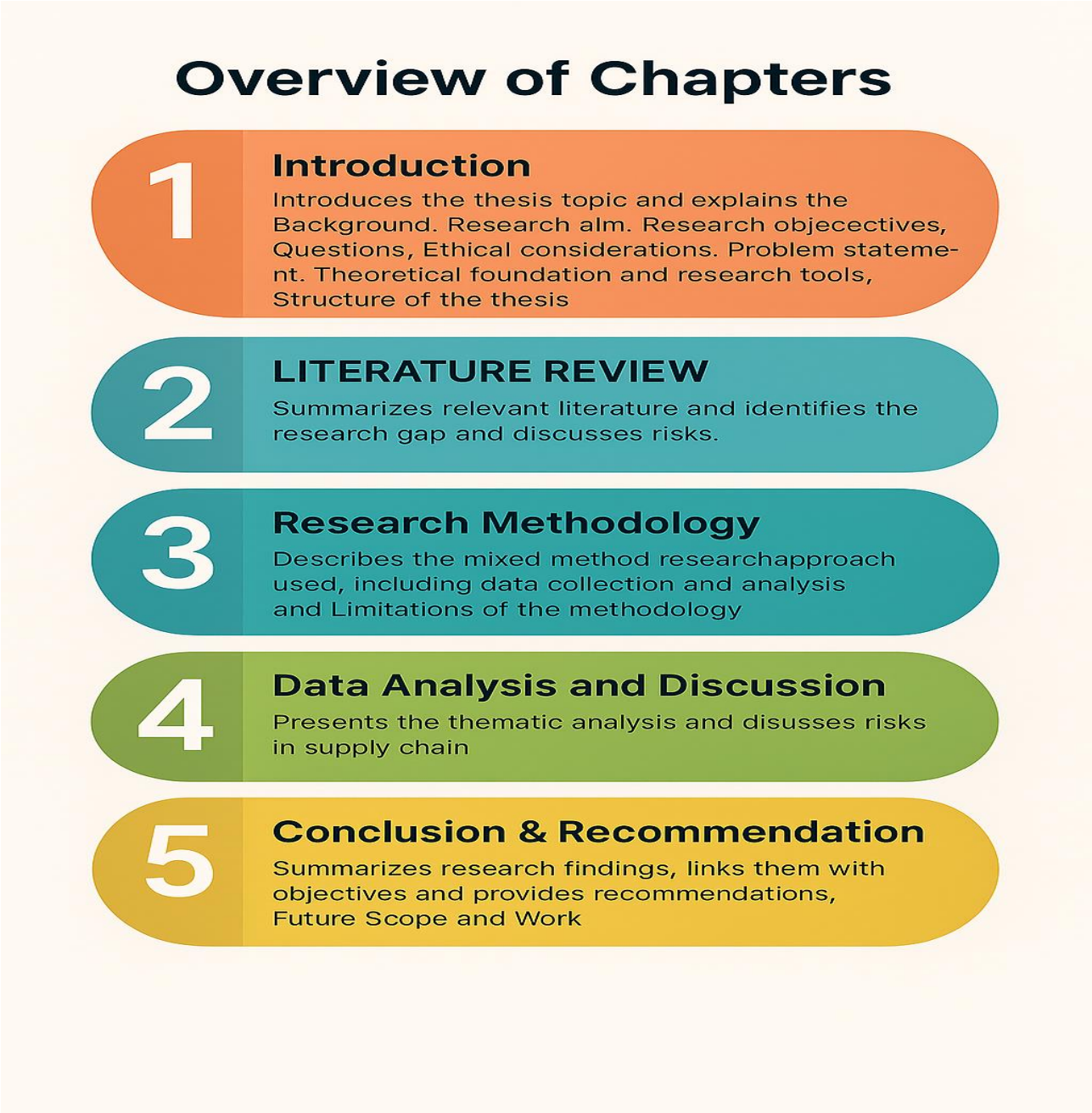

Figure 1: Overview of the Chapters

2 LITERATURE REVIEW

The food and beverage industry manufacturing firms within the country are said to possess major influences which are social and environmental. Therefore, incorporating supply chain management in food and beverage businesses such as Golden Harvest Agro Industries Ltd and Ben-gal Express Ltd is of very great importance since the food industry is the country's bloodline. According to Adams et al. (2022), food and beverage firms managers in

these companies have to understand the different pressures and embrace the appropriate supply chain management strategies to balance the risks. Further, there are sustainable practices required to achieve the different drivers or barriers influencing an effective strategy (Adams,2022). According to Bor (2021), food and beverage production businesses have to embrace green practices that start from raw material procurement to production, packaging, distribution, and proper disposal of the products. The green practices followed by the company introduce ecologically friendly ways of working that improve the coordination of customers and suppliers to enhance ecological responsibility (Bor,2021).

The food and beverage industry of Bangladesh is a significant contributor to the economy of the country, providing employment and livelihood opportunities all over the country. The industry, however, is plagued by numerous supply chain risks that are hindering its growth and sustainability. This literature review presents some of the research studies that have identified and studied these risks and present a vast array of information on the industry's problems (Masud,2017).

Bangladesh's exposure to natural calamities such as floods and cyclones poses a significant risk to its food value chain. For instance, the ruinous floods in 2024 destroyed approximately 1.1 million metric tons of rice, resulting in a 20% spike in food prices. These events highlight the necessity to develop resilient agriculture practices and infrastructures that can overcome environmental risks (Hossain,2021).

Industry 4.0 technologies have been hindered from being adopted in Bangladesh's food and beverage sector by a variety of hindrances. Among these, Rahman and Emon (2018) identified the main

hindrances to be the cost of implementation, lack of adequate skilled human re-sources, and infe-rior infrastructure. The overcoming of these hindrances is central to enhancing supply chain effi-ciency and competitiveness (Rahman,2024).

Effective risk management is required to minimize supply chain disruption. An exhaustive re-view of risk and disruption management of production-inventory and supply chain systems was pro-vided by author, emphasizing the requirement for proactive approaches to deal with uncertain-ties. Implementation of effective risk assessment frameworks can help make Bangladesh's food and beverage industry more resilient (Mohezar,2023).

Food safety is one of the critical components of the supply chain. Author assessed the microbio-logical quality of beverages sold in Dhaka, determining the contamination level is-sues (Singh,2025). Author identified the microbiological quality and antibiotic resistance patterns of the milk supply chain, indicating the need for stringent quality control measures to protect consumer health (Haji,2022).

According to Hossain and Mujeri (2020), inflation is found to inflate the cost of raw materials, transport, labour, and storage costs. Moreover, the increased price increases the profit margins and renders it difficult for food and beverage companies to compete. On the other hand, sup-ply shortages create low availability of resources resulting in a sharp rise in demand, currency fluctua-tion, natural calamity, and unfavorable weather. The geopolitical tensions are also found to have certain problems with the supply chain practices in the food and beverage industry. These result in disruption of food supply as well as incurrence of extra costs, increased lead times, and reduced overall business effectiveness (Hossain,2020).

Inclusion of environmental concerns within supply chain management, or green supply chain man-agement (GSCM), has been drawing notable interest recently. Author states that based on author, a GSCM literature review featuring trends and future concerns was addressed. Implementation of GSCM practices can help Bangladesh's food and beverage industry reduce environmental impacts and achieve sustainability (Mohamed, A. E. (2021)).

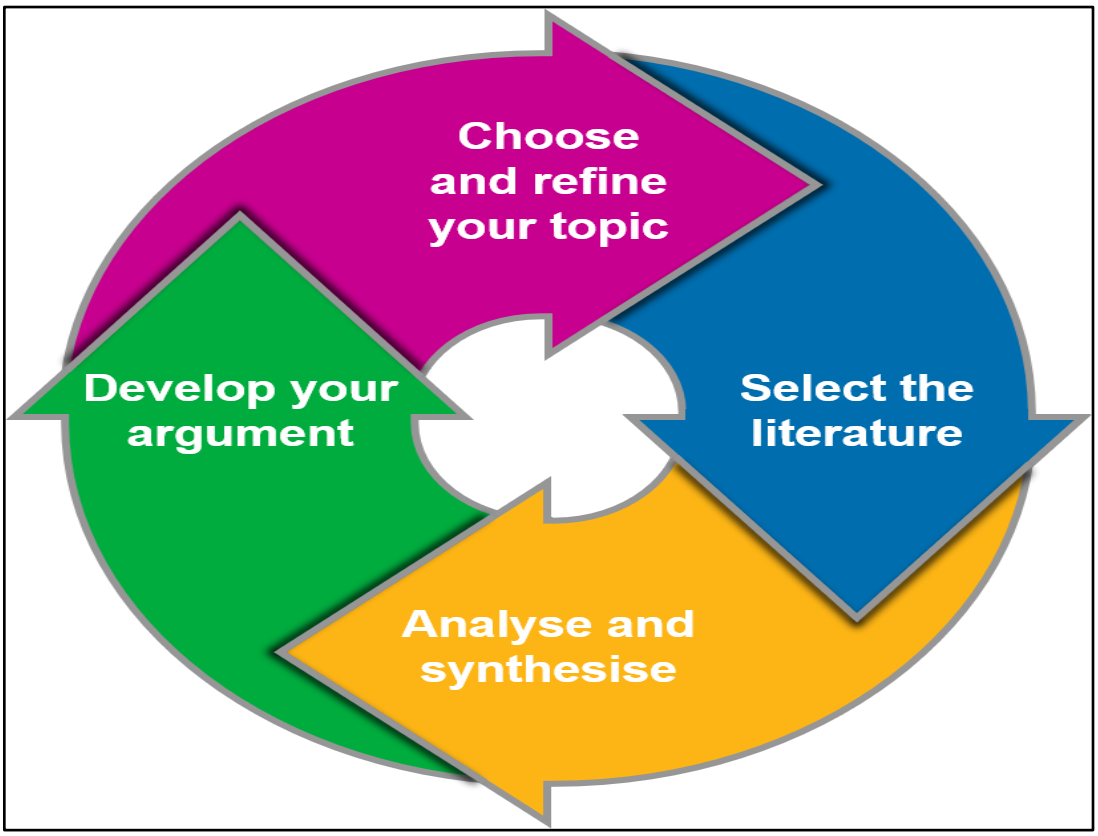

Figure 2: Process of Conducting Literature Review

Source: (Monash, 2025)

Global economic conditions, including inflation and food crises, may affect the food and bever-age supply chain of Bangladesh. The 2022–2023 global food crises resulted in price increases in key commodities, impacting consumer purchasing power and supply chain stability.

To develop measures for lessening their impact on the domestic business, it is important to com-prehend these global tendencies (Nekmahmud, M., 2024).

In short, the literature outlines a sophisticated set of supply chain risks to Bangladesh's food and beverage industry encompassing environmental hazards, technological adoption challenges, qual-ity control risks, and global economic pressures. The mitigation of these risks necessitates an inte-grated response that integrates technological innovation, robust risk management frameworks,

sustainability initiatives, and adaptive business models to construct the sector's resilience and sustainable growth.

2.1 Research Gap

While there are many literatures works that examine supply chain vulnerabilities in the food and beverage industry, there are some necessary research gaps that remain unresearched, particlarly in the case of Bangladesh. First, there is limited research from a regional perspective that extensively examines the unique supply chain risk issues in Bangladesh. Most research ex-amines global supply chain risk factors, but the unique economic, environmental, and regulatory conditions in Bangladesh require investigations that are specially adapted.

Second, not much study has examined how natural catastrophes and climate change affect Bangladesh's food supply systems. Despite the nation's extreme vulnerability to floods, cyclones, and rising temperatures, there is still a dearth of empirical evidence on how these natural disasters directly affect food production, logistics, and prices.

Third, not enough research has been done on how Industry 4.0 and digitization might lower supply chain risk. Though their adoption and impact on Bangladesh's food industry have not been well studied, digital technologies like blockchain, AI-based predictive analytics, and IoT-based tracking offer the potential to improve supply chain resilience.

Fourth, ethics- and labor-based risks are insufficiently studied. These include issues with child labor, unequal remuneration, and dangerous work environments in the produce and seafood sectors that require careful investigation relative to business social responsibility and good trade practice.

Finally, there must be more data-driven risk assessment models created with real-time supply chain disruptions, market volatility, and socio-economic conditions. By plugging these gaps, policymakers, companies, and researchers will receive actionable insights so that there can be a more resilient and sustainable food supply chain in Bangladesh.

3 RESEARCH METHODOLOGY

3.1 Introduction

Methodology is a part of any study because it prescribes the methodology used in collecting, analysing and interpreting data. The methodology makes research systematic, reliable, and replicable. The present study aims to identify and assess the supply chain risks in the food and beverage sectors in Bangladesh using a mono-method research design that is secondary data analysis. This subsection outlines the research philosophy, research methodology, research choice, data collection method, and data analysis process used in the research.

3.2 Research Philosophy

The research philosophy dictates the inherent assumptions of data analysis and collection. The research utilizes a positivist research philosophy, which centers on objective and measurable facts rather than subjective interpretation. Positivism is suited for secondary data analysis because it relies on empirical evidence gathered from credible sources such as peer-reviewed journals, industry reports, and government publications (Saunders et al., 2019).

3.3 Research Approach

The research design prescribes data collection and processing. In the current study, a deductive approach is used, which starts with existing theories and frameworks on supply chain risks and compares them with secondary data (Bryman, 2016). Utilizing the deductive approach allows verification of existing supply chain risk management methods in the context of Bangladesh's food and beverage industry.

Figure 3: Research Methodology

3.4 Research Choice

Research designs involve mono-method, mixed-method, and multi-method approaches (Cre-swell & Clark, 2017). In this research, a mono-method approach of collecting and analyzing secondary data alone is employed. The choice is made with an eye to the need for an exhaustive evaluation of existing literature and statistical data so as to make available a definite idea of supply chain risks.

3.5 Data Collection Method

Data collection is a critical stage of research that aims at gathering information relevant to answering research questions. The research utilizes a secondary data collection method because it is cost-

effective, time-efficient, and has accessible large amounts of data. The secondary data sources are:

(a)Peer-reviewed journals and scholarly articles on IEEE Xplore, Google Scholar, and ScienceDirect.

(b)Industry studies reports and white papers of institutions like the Food and Agriculture Organization (FAO), Bangladesh Bureau of Statistics (BBS), and World Bank.

(c)Statutory reports and government documents enunciating food safety and supply chain management policies.

(d)News reports and market studies in order to capture prevailing trends and disruption of Bangladesh's food and beverage sector.

The selection criteria for secondary sources will be credibility, relevance, and date of publication to pick current and authentic data.

3.6 Data Analysis Method

Content analysis and statistical trend analysis are the primary data analysis techniques employed in the research.

3.6.1 Content Analysis

Content analysis is used to systematically examine textual data from secondary sources. The method detects recurring themes, trends, and key risk factors in the food and beverage supply chain. Qualitative literature will be coded into environmental, operating, financial, and regulatory risks.

3.6.2 Statistical Trend Analysis

Quantitative data from industry and government reports will be analyzed to identify supply chain disruption patterns. Descriptive statistics (percentage change, mean, standard deviation) will be

used to analyze supply chain risks. For instance, inflation patterns, food price volatility, and logistics performance index (LPI) data will be analyzed to identify external risk drivers affecting the industry.

3.7 Limitations of the Methodology

Although secondary data analysis has valuable information, it is not without its limitations:

(a)Data reliability: There might be already-dated reports or a tendency to be biased, which requires prudent source assessment.

(b)Indirect findings: The research does not have primary findings in the form of industry interviews or surveys.

(c)Contextual inadequacies: Consolidated observations from international literature do not necessarily capture Bangladesh's differential supply chain culture.

Chapter three explained research methodology used to ascertain supply chain risk for the food and beverages sector of Bangladesh. Through the application of the mono-method secondary data analysis process, the research will generate a systematic, cheap, yet comprehensive analysis of literature and statistical trends. Conclusions will be useful in identifying key risk factors facing the industry, apart from providing insights toward future supply chain resilience planning.

4 DATA ANALYSIS AND DISCUSSION

With an emphasis on supply chain risks in Bangladesh's food and beverage sector. This chapter provides a thorough analysis of the data gathered to meet the study's goals. The results are obtained by a mixed-method approach that includes quantitative statistical trend analysis of secondary datasets and qualitative content analysis of industry reports, case studies, and scholarly literature. Climate vulnerability, logistical inefficiencies, economic volatility, and moral dilemmas like worker exploitation are some of the main topics covered. The findings are critically interpreted in the discussion, which also places them within the socioeconomic and environmental context of Bangladesh and connects them to theoretical frameworks such as supply chain resilience and stakeholder theory. This part not only emphasizes the interconnectedness of supply chain vulnerabilities but also connects empirical results with practical measures to improve sectoral resilience by coordinating the analysis with the study's goals. The chapter ends by discussing how these risks affect consumer confidence, company performance, and national food security, setting the stage for evidence-based suggestions in the sections that follow.

4.1 Data Analysis

4.1.1 Thematic Table

Table 1: Thematic analysis Table

Themes	***Authors***	***Dindings and Relavance of the study***
Theme 1: The Role of Supply Chains in Food and Beverage Organizations	Rahman, M., Emon, M. E. H., Antor, M. H., Haque, S. A., & Talapatra, S. (2025).	Importance of supply chain management in business operations. Contribution of supply chains to efficiency, profitability, and sustainability.
	Sarker, A., Ghosh, M. K., Islam, T., Bilal, M., Nandi, R., Raihan, M. L., ... & Kim, J. E. (2022)	
Theme 2: Types of Supply Chain Risks in the Food and Beverage Industry	Settembre-Blundo, D., González-Sánchez, R., Medina-Salgado, S., & García-Muiña, F. E. (2021)	Environmental risks (natural disasters, climate change) Operational risks (transportation, logistics, energy disruptions) Economic risks (inflation, trade policies, supply shortages)
	Gurtu, A., & Johny, J. (2021).	
	Metin, B., Özhan, F. G., & Wynn, M. (2024)	
	Raja Santhi, A., & Muthuswamy, P. (2022)	Financial losses, increased costs and production Disruptions and

Theme 3: Negative Effects of Supply Chain Risks on Businesses	Dadush, U. (2023). Davis, K. F., Downs, S., & Gephart, J. A. (2021).	reduced competitiveness have an impact on food security and consumer trust
Theme 4: Strategies for Mitigating Supply Chain Risk	Sharma, M., Joshi, S., Luthra, S., & Kumar, A. (2022). Shen, C., Wei, M., & Sheng, Y. (2021). Ali, S. R., Hossain, M. A., Islam, K. Z., & Alam, S. S. (2024).	Technological solutions (digital tracking, predictive analytics) Policy and regulatory improvements (food safety regulations, trade agreements) Sustainable sourcing and ethical labour practices
Theme 5: Building Resilience in the Food and Beverage Supply Chain	Shamsuddoha, M., Nasir, T., & Hossain, N. U. I. (2023). Panigrahi, R. R., Mukherjee, S., Shaikh, Z. H., & Nomran, N. M. (2025). Choudhury, M., & Haque, C. E. (2024)	Adaptation to climate risks and infrastructure investments Strengthening supply chain transparency and traceability Developing risk assessment and crisis management frameworks

4.1.2 Thematic Analysis

4.1.3 Theme 1: The Role of Supply Chains in Food and Beverage Organizations

According to Rahman, et al., (2025), supply chain management is a critical component for Bangladesh in the food and beverage industry. It is generally influenced by the efficiency of product quality and the distribution process. However, the overall understanding broader study of competition critically evaluates a well-structural development regarding the supply chain pro-cess that ensures a seamless product offering to the customers. It properly maintains quality and meets demands apparently. The basic interferences and disruptions can lead to significant challenges by affecting both businesses and consumers as well. The significance of the supply chain management process in the Bangladesh food and beverage industry is compiled with important points. These are mostly economic contributions, employment generation, product quality and safety and market competitiveness.

As per author Sarker, et al., (2022), the strong economic contribution in the food processing sector defines some vital approaches to Bangladesh's economy. It critically contributes to a significant factor regarding employment and GDP. However, between 2004 and 2010, the industry grew at an average of 7.7% per annum. From the year 2011 employment increased by around 5.45% in the country's total level of force accounted for the maximum GDP concerns. Employment generation started in the food processing industry at around 2.2% of the total workforce. 19% of the industrial manufacturer workers and 6.5% of total manufacturing labour or present in Bangladesh in the current scenario. Regarding product quality and safety, robust supply chain management ensures that food products are quality and safe. The crucial aspect of the study indicates a strong consumer trust and meeting with both domestic and international regulatory affairs. Moreover, several challenging factors such as lack of transparency and preserve-ability can complaints with the verification of product origin regarding the quality that can lead to a significant challenge in maintaining food safety standards. The authors Ning & Yao, (2023), indicate that part of market competitiveness defines an efficient supply chain program that enables companies to respond to market demands which reduces operational cost and enhances competitiveness. This type of agile function is essential in the first movie in the consumer goods sector. In addition, the supermarket chain Bangladesh Shwapno was established in 2008 which became the largest Bangladesh market scene

with a share of 44%. Define some important justification regarding the effective supply chain management process as well. A proper statistical overview represents certain aspects of Bangladesh regarding food and beverage supply chains.

Table 2: Statistical overview of certain aspects of Bangladesh's food and beverage supply chain.

Metric	***Values***
Annual Growth Rate of the Food Processing Industry (2004-2010)	7.7%
Contribution to GDP by Food Processing Industry (2010)	2.01%
Employment in Food Processing Industry (2010)	2.45% of the total labour force
Market Share of Shwapno in Super Shops Sector	44%
Rice Destroyed Due to Floods (2024)	1.1 million metric tons

Behind the importance of the supply chain management process in Bangladesh are huge food and beverage-related challenges that the country is currently facing. Challenging factors include infrastructure limitation, supply chain disruption, quality control-related problems and other technology-challenging factors regarding the limited amount of adaptability criteria. The authors Amin, et al., (2024), the country Bangladesh now adopts Industry 4.0 technology which is much slower than the other countries. A study in a Brazilian journal signifies that some operation and production Management justifications have adapted to the 4th industrial technology advancement process by improving supply chain performance in the manufacturing sector of Bangladesh.

4.1.4 Theme 2: Types of Supply Chain Risks in the Food and Beverage Industry

As per Settembre-Blundo, et al., (2021), the operational risk management process defines an important portion regarding the disruption of internal processes that can hinder production and distribution in the operation of risk. This mostly includes equipment failures that bring machinery aspects which can lead to production halts. As intense in 2023 a major manufacturer reported around 15% degrade in the output due to unexpected equipment malfunctions. Inadequate staff training programs and untrained personas of employees may mishandle certain equipment regarding the processing. A survey from 2022 indicates that 40% of food processing organisations face operational delays attributed to insufficient staff training programs. The initial inventory management process defines short inventory practices that can cause overstocking or stockouts. In the year 2021, 35% of the food retailers experienced stock-out-related problems in Bangladesh for essential items that can lead to a 5% revenue loss. Operational challenges can lead to the increased cost of production dealers and dismissed customer satisfaction.

By the authors Gurtu & Johny, (2021), the external risk factors originate from organisation and control that can impact supply chain stability. The external risks are mostly included with re-source shortages where climate change and natural disasters play a crucial role. Moreover, cybersecurity related threats are the main concern in the present day regarding regulatory changes. Resource-based collaboration is mostly included with Global events that can deserve the availability of raw materials. As an example, Russia and Ukraine completely lead to the major challenges to export shortages of commodities flights such as wheat or sunflower oil that cause price surges and other supply gaps. Climate change and natural disasters signify extreme weather events that can reverse studied crops and infrastructure. In the year 2020, US reposts exports projected at a 52-year low due to the adverse climate condition that highlights several vulnerabilities regarding the agriculture outputs of environmental factors. Moreover, the authors Metin, Özhan & Wynn, (2024) indicate that cybersecurity-related threats are the increasing problem of the digitalisation of the supply chain that exposes them to cybersecurity attacks. A report from 2021 defines that 30% of food and beverage complaints experienced cyber threats which is the main reason for operational disruptions. The regulatory changes indicate a certain Swift on the operation adjustment. In 2022, 25% of the Food exports faced compliance and challenges due to the sudden challenges in the international food safety standards.

4.1.5 Theme 3: Negative Effects of Supply Chain Risks on Businesses

The authors Raja Santhi & Muthuswamy, (2022) mention financial losses and increased cast distribution such as political instability and natural disasters signify an effective production and distribution network. However recent political unrest can lead to factory closures and transparent challenges which is the main reason behind the substantial financial losses in the textile sector. The Bangladesh Textile Mills Association reports several roses that account for approximately USD 58 million during the crisis time. The specific data regarding the study contest of the food and beverage industry unlimited with a similar number of vernier is that exist regarding the shared infrastructure and other economical conditions as well.

In the case of production the authors Dadush, (2023), disruption and reduced competitiveness of the supply chain vulnerabilities include natural calamities regarding labour unrest and other infrastructure issues that can lead to the production halt and delays. This type of disruption compared to the ability of the business to meet international standards regarding certain deadlines hurt the competitiveness of global markets and critically evaluate several justifications. The ready-made garment sector faced several challenges such as high dependency on imported materials and other lack of product diversification. It defines susceptibility regarding the Global competition. The food and beverage industry shares supply chain characteristics which are more equal to the experience of comparable challenges that can affect the market positions in an effective way.

However, Davis, Downs & Gephart, (2021) indicate a basic understanding regarding the impact of food security and consumer trust. The supply chain disruption can lead to several shortages of essential commodities. It mostly focuses on certain impacts regarding food security. However, the certain example of the recent crisis in Bangladesh significantly indicates several aspects in the Global supply chain textiles and appeals. It generally leads to increased costs and delays. However, the food and supply chain can lead to several shortages shortcuts which is the main reason for increased prices and diminished consumer trust in product availability and safety-related options.

4.1.6 Theme 4: Strategies for Mitigating Supply Chain Risk

As per Sharma, et al., (2022), the mitigation process of supply chain risk in Bangladesh's food and beverage industry requires a multifaceted approach that encompasses technological ad-vancements. However, policy reforms and sustainable practices play a crucial role regarding technology solutions, policy and regulatory improvements and sustainable sourcing with ethical level practices in Bangladesh. The technological solution defines certain implementations of digital tracking systems and predictive analysis that can enhance supply chain visibility and efficiency at the same time. Advanced Technological integration such as artificial intelligence and IoT help in the monetization process of production. However, in predictive equipment failures and other optimisation logistics the main approach of the advanced technologies. Moreover, the adaptability criteria suggest technology in Bangladesh defines the first moving consumer goods sector which is still emerging with some salt in challenges such as shortages of skilled la-bour that hinder white spirit implementation.

The authors Shen, C., Wei & Sheng, (2021) indicate that policy and regulatory improvement define strengths and values regarding the food safety approaches as a major engagement in international trade agreements. It is the most crucial factor to mitigate supply chain-related risk. In Bangladesh, consultation emphasizes improving public health and nutrition and laying the groundwork for important policies that aim for sustainable development. However, several challenges persist and include unlimited averness factor with a comprehensive ear understanding regarding the sustainable practices. Restricted values access the financial and inadequate infrastructure as well.

As per authors Ali, et al., (2022), in terms of sustainable sourcing and ethical level practices, a certain adoption regarding the green supply chain practice ensured the ethical level standards which are vital regarding sustainability in Bangladesh. However, for the adoption of green sup-ply chain practices with comprehensive attention, it is the most suitable factor as well. The main concern of the study is the impact of sustainable development. However several challenges such as lack of awareness and limited access to the financial justifications with the in aquatic infrastructure hinder the white spread implementation.

4.1.7 Theme 5: Building Resilience in the Food and Beverage Supply Chain

The authors, Shamsuddoha, M., Nasir, T., & Hossain, (2023) define building resilience in Bangladesh's food and beverage supply chain necessities as are multifaceted approach which ad-dresses climate risk and enhances infrastructure and strength in the transparency values. In the adoption of climate risk and infrastructure investment, Bangladesh's susceptibility program regarding climate-induced disasters such as floods and cyclones causes a significant threat. Indi-cates a major challenge to agricultural productivity and other food reciprocity concerns. Regarding the study contest in October 2024, floods destroyed approximately 1.1 million metric tons of rice plants which led to increased imports shooting foot prices. Tum mitigate this type of risk factor a sustainable investment in climate resistance infrastructure is essential. The Bangladesh climate and development platform established a strong collaborative approach with international financial institutions that consist of private sectors that aim to labour is adoption and mitigation investments directly.

As per Panigrahi, et al., (2025), Bangladesh mostly focuses on innocent transparency and credibility factors within the supply chain management process. It is the most crucial part which ensures food safety and quality at the same time. The implementation of digital technology such as blocks and other IoT-related aspects can easily facilitate real-time tracking a be products from farm to table. A brief study critically analyses the impacts of digital transformation on the supply chain that highlighted the effectiveness of technology improvements in terms of traceability and transparency. In Bangladesh, the export-oriented shrimp supply chain has existed for traceability information loss. It emphasizes the need for robust information systems to prevent food safety crises and economic downturns.

Authors Choudhury & Haque, (2024) indicate certain developments in risk assessment criteria and crisis management Framework established comprehensive justification which is vital for anticipating and mitigating potential disruption. A potential study understanding critically evaluates some important initiatives that can empower communities and enterprises for better management in risk-associated factors with climate variability.

4.2 Discussion

The results highlight the complexity of supply chain risks in Bangladesh's food and beverage industry, where economic volatility, infrastructural deficiencies, and climatic challenges combine to cause operational instability. The approach highlights systemic interdependencies by placing these risks within frameworks of stakeholder theory and supply chain resilience. For example, floods can cause logistical delays and ethical labor difficulties by disrupting the availability of raw materials. These findings are consistent with international research, but they also draw attention to Bangladesh's particular weaknesses, namely its reliance on unofficial supply chains and slow adoption of new technologies. The conversation goes on to examine how these issues reduce competitiveness, increase food insecurity, and call for comprehensive mitigating techniques to match immediate recovery with long-term sustainability objectives.

4.2.1 Reliability and ethics:

Reliability

Reliability in the study is strengthened by using important and credible secondary data sources, including government reports, peer review channels and globally recognised databases. By triangulating data from multiple sources, the findings maintain accuracy and consistency (Awan, Yahya, & Arif, 2023). However, while primary data could provide more accurate insight, the extensive use of secondary literature mostly ensures a comprehensive industry perspective. Moreover, repeated themes across sources, such as the impact of logistical description and flood, reinforce their source consistency. This approach increases the validity of the conclusion and supports a well-documented analysis of industry risk. This ensures that finding security reflects real-world challenges within the sector. Reliability in the study is part of the rainforest through metrological rigour, ensuring data selection is completely aligned with scholarly accuracy and industry trends. The inclusion of diverse sources from multiple regions contributes to the robustness of findings by accounting for variation in environmental, academic and operational contexts.

Table 3: Evaluation of research questions and how well they match the goals of the study

Objectives of the study	***Objective-wise research questions***	***Evaluation of How Well the Question Was Answered***
1. Investigate the influence of the supply chain within food and beverage organizations	What is the effect of the supply chain on the food and beverage firm?	The study thoroughly analyzed the critical role of supply chains in ensuring efficiency, product quality, market responsiveness, and resilience against disruptions. The data, especially from thematic and statistical analysis, supports a strong link between supply chain strength and business performance.
2. Identify different risks in the supply chain faced by food and beverage companies in Bangladesh	What are the risks in the supply chain to food and beverage firms operating in Bangladesh?	The thesis categorizes risks into environmental (floods, climate), operational (logistics, infrastructure), economic (inflation, geopolitical issues), and ethical (labor exploitation). Rich secondary data and examples (e.g., 2024 flood impact) support this assessment.
3. Analyze the negative effects of identified risks on Bangladeshi food and beverage firms	What are the effects of the identified risks in food and beverage companies in Bangladesh?	The study clearly outlines financial losses, reputational damage, operational inefficiencies, and legal risks using both thematic analysis and real-world examples (e.g., rice destruction, cyber threats).

Ethical considerations, researcher's role and transparency

Ethical considerations are important when examining sensitive topics such as food safety in the supply chain and labour exploitation. The study mostly indicates ethical integration by reliance on credible and verified sources, ensuring that no individual's privacy is compromised. However, the analysis is strictly based on publicly available and properly cited literature, preventing any unauthorised use of data approach, avoiding commercial and personal bias while interpreting findings. Also, transparency is reinforced through clear citation and acknowledgement of all referenced materials (Serghiou et al., 2021). Furthermore, complex issues related to regulatory shortcomings and labour abuse or addressed constructively to encourage meaningful policy re-form. By maintaining ethical responsibility and objectivity, the study contributes to informing the discussion on sustainable business practice and corporate accountability in the global supply chain.

Challenges and limitations

The study faces several challenges, primarily the lack of restricted access to proper industry insight and the lack of real-time data, especially in the dynamic landscape of the supply chain. Moreover, regional variation in practices may not be fully represented in the global future which making a difficult to draw a universally applicable conclusion. Another limitation is the underrepresentation of medium and small enterprises, which play an important role in the Bangladesh food industry (Nordhagen et al., 2021). Finally, future research can address this gap by conducting interviews and a primary survey with industry professionals to provide some more comprehensive analysis of current aspects, emerging risks and localised challenges within the sector. Another challenge faced in the study is the difficulty in verifying the relevance and accuracy of secondary data, as some sources may not reflect the current developments in sup-ply chain disruption. Additionally, the study encounters limitations in analysing in formal sup-ply chain network, which is prominent in Bangladesh but often like documented data.

4.2.2 Effect of the Supply Chain on Food and Beverage Firms

As per Shakur, et al., (2024) in Bangladesh, the food and beverage industry makes a significant contribution to the economy with the fast-moving consumer goods sector experiencing rapid growth. The authors Feng, et al.,(2024) that efficient supply chain management processes in this

sector play a crucial role in the maintenance of product quality which reduces the operation and costs apparently. In addition, Khandoker, et al., (2022) signify a certain meeting regarding the consumer demand understanding properly highlights certain influencing criteria in the current market. However, the most controversy regarding the influencers and other disruptions in the supply chain management process can lead to increased cost product shortages and loss of consumer trust. However, during the COVID-19 pandemic, the supply chain disruptions led to several challenges in sourcing raw materials and indicated a major fact in distributing products adversely affecting business operations.

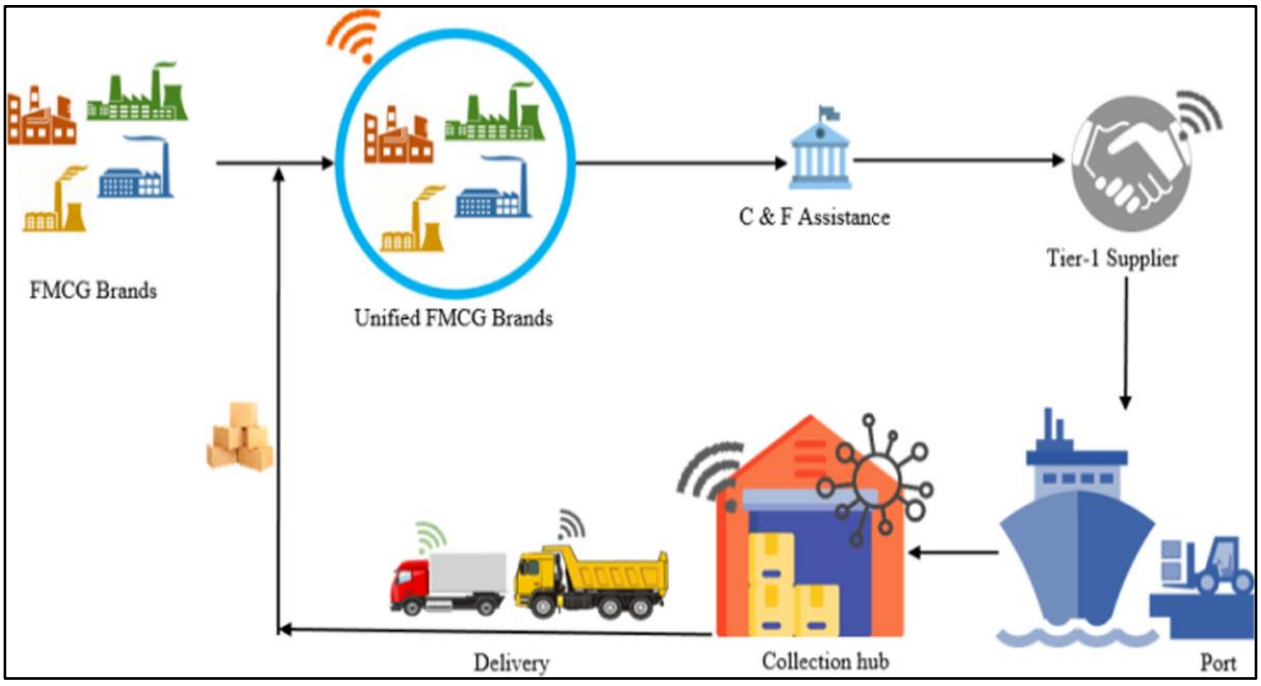

Figure 4: Strategical Adjustments of Bangladesh of the Supply Chain on Food and Beverage Firms.

4.2.3 Risks in the Supply Chain for Food and Beverage Firms in Bangladesh and Their Effects

The food and beverage companies in Bangladesh face several supply chain-oriented risks that can significantly impact the operation of values. It generally included natural disasters, supplier non-compliance, logistical challenges and other economic instabilities with labour exploitation. In the event of a natural disaster, as per Paul, (2024), Bangladesh is prone to natural disasters such as floods and cyclones. As an example, October 2024 floods destroyed approximately 1.1 million tons of rice which can lead to increased value regarding imports and soaring food prices. However, Haji,

Kerbache & Al-Ansari, (2022) defines reliance on suppliers who fail to meet the quality standards can result in ingredient adulteration and compromise product quality. The authors Manning & Kowalska, (2021) indicate that this not only poses health risks to consumers but also defines certain damages regarding the organisation's certificate. The logistic challenges define infrastructure limitations and other transportation-related issues. It leads to the delays in product delivery system by effective invented levels and leads to potential stock-outs and overstocking situations. Economic instability defines fluctuations in currency exchange rates and economic policies. It has a major effect on the cost of improved raw materials which has a major impact on the price in strategies and profit margins.

4.2.4 Effects of Identified Risks

The most common and identified risks in Bangladesh regarding these types of industries are financial losses, reputational damage, operation inefficiencies legal implications.

Table 4: Effects on the Identified risks that Bangladesh faces.

Risks	***Effects***
Financial Losses	Supply chain disruptions can lead to increased operational costs, reduced sales, and lower profit margins.
Reputational Damage	Several issues such as product recalls due to quality failures can erode consumer trust and brand loyalty (Siddika & Ahmad, 2022).
Operational inefficiencies	Unwanted delays and disruptions can lead to production halts, affecting the overall efficiency of the firm.
Legal Implications	Non-compliance with labour and environmental standards can result in legal penalties and loss of licenses (Ning & Yao, 2023).

Measures to Address Supply Chain Risks in Food and Beverage Companies in Bangladesh

To mitigate the aforementioned risks, food and beverage companies in Bangladesh implement several strategies such as diversifying their supplier base, investing in technology, strengthening infrastructure, implementing ethical practices and developing crisis management plans accordingly. Moreover, certain engagement criteria with a collaborative plan, enhance inventory management and training who related programs held to measure food and beverage organisations in Bangladesh which can enhance the resonance of their supply chains (Ali & Aboelmaged, 2023). It mostly ensures sustained growth and a comparative place in the current market situation.

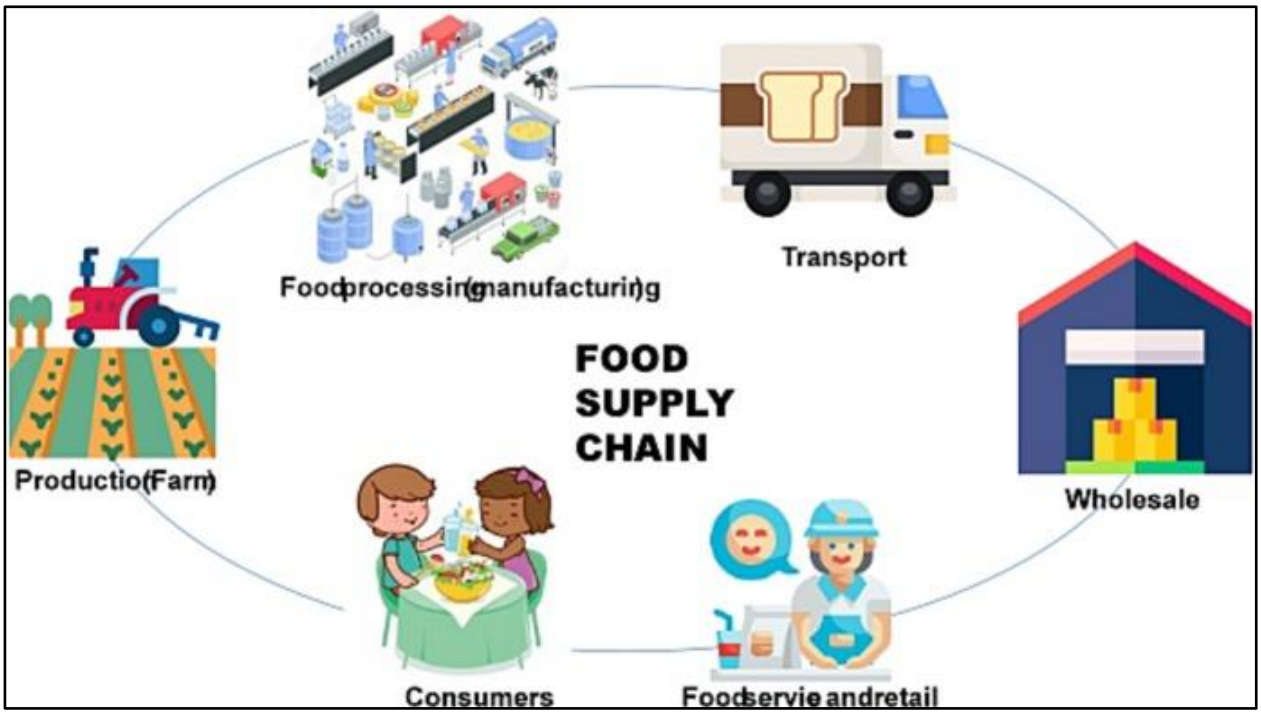

Figure 5: Assessing the vulnerability of food supply chains to climate change induced disruptions

Source: (Tchonkouang, R. D., Onyeaka, H., & Nkoutchou, 2024)

Diversifying supplies base relays on multiple suppliers can reduce dependency on a single source and mitigate risk associated factors with suppliers and noncompliance factors. As per Javaid, Haleem & Suman, (2023) a certain investment in the technology helps in the implementation of

digital tracking systems and predictive analysis processes. As a supportive aspect Sallam, Mohamed & Mohamed, (2023) indicate that it helps to enhance supply chain visibility by allowing proactive management for potential resolution. In addition, Guidani, Ronzoni & Ac-corsi, (2024), adopting blockchain technology can improve transpiration in the agri-food supply chain. The strengthening value regarding the infrastructure Management process defines a strong collaborative nature with government agencies to improve transportation and logistics infrastructure (Rukanova, et al., 2023). Implementation of ethical practices ensures fair labour practice and sustainable sourcing that can improve brand image and meet growing consumer demand for ethical production. Moreover, developing a crisis management plan helps to establish a comprehensive risk assessment and crisis management program to respond effectively to unforeseen events. A certain engagement in collaborative planning devices working closely with suppliers and distributors can enhance responsiveness and reduce uncertainty. Implementing a robust inventory management system can help to maintain the operation of livestock and reduce the impact of supply chain disruption (Ikpe & Shamsuddoha, 2024). A major investment in the training and development programme in hand skill-related approaches to supply chain management ensures better handling of potential risk.

5 CONCLUSION & RECOMMENDATION

5.1 Conclusion

The food and beverage industry in Bangladesh plays a crucial role in the country's economy which has a major contribution to employment, GDP and overall economic stability. However, this sector faces numerous challenges in the supply chain management process that can disrupt operations and affect profitability. It indicates are threatening situation in the food security concerns. However, the study identifies various risk factors including environmental aspects, such as climate change, and operational challenges such as transportation and logistic efficiency. However, economic risks such as inflation and supplier non-compliance with technological integration such as cyber security threats. This type of disruption impacts business by increasing costs and reducing competitiveness. It continuously affects the availability of essential food products.

However, the study highlights that supply chain risk not only affects organisations but also has a broader implementation for consumer and national food security concerns. Addressing this type of risk-oriented factor requires proactive strategies such as improving infrastructure, adopting technological solutions and enforcing regulatory compliance by promoting ethical la-bour practices. Strengthening values regarding the supply chain resilience through collaborative industry efforts and government support which is necessary for ensuring long term sustainability in the food and beverage industry in Bangladesh.

5.2 Linking with Objectives

The research was mostly conducted with some key objectives. **An investigation of the influence of supply chains in food and beverage organizations** indicates a conference that will manage the supply chain to enhance operational efficiency (Saryatmo, & Sukhotu, 2021). Moreover, it also reduces cost and improves market responsiveness. A robust supply chain is essential for maintaining quality, meeting consumer demands and sustainable business growth as well**. Identifying Supply chain risks in food and Beverage companies in Bangladesh,** the study indicates the various risks that affect industries including climate-induced disasters and supply chain disruptions (Ngameni

Tchonkouang, Onyeaka & Nkoutchou, 2024). Financial instability, labour exploitation and cybersecurity-related threats are the most identified options as well. This type of risk creates a significant challenge which ensures a continuous operation and product availability as well. **In analysing the negative effects of identified risks**, the study findings demonstrate that supply chain disruptions lead to financial losses, product inefficiencies, and reputational damage and define threatening attributes (Etemadi, et al., 2021). It has a major impact on the consumer through price volatility and supply volatility as well. The recommendable parameter **on a solution for mitigating supply chain risks** suggested several mitigation strategies including technology advancement and policy reformations, diversification of suppliers and sustainable sourcing practices (Tao, et al., 2025). These types of measurements help businesses build resilience and maintain stability in the face of supply chain disruptions.

5.3 Recommendation

5.3.1 Adoption of technology in supply chain management

Blockchain technology and its implementation indicate transparency and traceability in the supply chain which ensures product authenticity and quality as well. Artificial intelligence and predictive analysis are mostly used for AI-driven forecasting models to predict demand fluctuations and optimize inventory management (Gligor, et al., 2022). caste models to predict demand fluctuations and optimise the inventory management process. IoT-based sensors help in proper monetization in logistics and warehouses to track real-time conditions of food products and prevent spoilage.

5.3.2 Retaining infrastructure and logistics

A certain improvement in transportation networks defines the development of modernised transport and logistic infrastructure to reduce delivery delays and operational inefficiencies. By establishing more cold storage facilities, more units ensure food safety and extend the shelf life of perishable products (Moh'd Anwer, 2022). Optimising the supply chain process at ports and warehouses mostly helps to reduce bottle nix and improve efficiency equally.

5.3.3 Diversification of supply Supplier Base

By reducing over resilience on a single supplier define strong engagement criteria with multiple suppliers to prevent disruptions. It is the main reason to prevent disruptive approaches that are caused by geopolitical tensions or supplier failure (Katsaliaki, Galetsi & Kumar,, 2022). A certain expansion of local and global networking systems indicates a strong building approach to relationships with both domestic and international suppliers to enhance supply chain flexibility effectively.

5.3.4 Implementation of Ethical and Sustainable Sourcing Practices

Enforce fair wages and better working conditions eliminate labour exploitation and ensure ethical supply chain operations effectively. However, sustainable agriculture and raw material materials Sourcing promote environmentally sustainable practices to minimise the industry's eco-logical impact (LeBaron,, 2021). The CSR initiatives encourage the business to adopt responsible supply chain practices which can enhance consumer trust and increase the brand reputation equally.

5.3.5 Policy and Regulatory Improvements

Enhancing food safety regulations defines strengthened values with comprehensive implementation of strict quality control measurement to prevent contamination and ensure compliance. Introducing several government-supportive initiatives helps to establish climate adoption policies for disaster maintenance (Sorbo, et al., 2022). It has a major impact on food production techniques. To combat illegal threats and smuggling, Bangladesh enforces some activities to disrupt this type of illegal work with some legal approaches regarding the supply chain and market stability concerns.

5.3.6 Developing Crisis Management and Risk Assessment Frameworks

By creating a contingency plan regarding the supply chain disruption, develop crisis management protocols which have a major impact on business responses to unforeseen challenges. However, conducting regular risk assessments improves several implementable criteria regarding the continuous revaluation process of supply chain vulnerabilities to mitigate potential threats (Kumar & Sharma, 2021). Encouraging strong industrial collaboration defines a strong partnership program

between the government, private sector and international organisations. It has a major effect on enhancing supply chain resilience.

5.4 Future Scope

The study highlights several areas regarding future Research and industrial development as well. The integration ***of advanced digital technologies*** has a major future research scope that mostly focuses on the impact of AI, blockchain and IoT by improving supply chain efficiency and reducing risk in Bangladesh's food and beverage industry (Khan, et al, 2024). The ***climate change and its long-term effects on food and supply chains*** signify that more studies are important with the precise research regarding the adoption strategies that can be properly implemented. However, ***strengthening the Global and regional supply chain partnership*** program can help to explore international trade policies and partnerships to enhance supply chain residence by minimizing global disruptions (Gereffi, Lim & Lee, 2021). The ***ethical and social responsibility in supply chain*** analysis is the efficiency of AI-based supply chain forecasting models that can improve decision-making and mitigate disruptions in Bangladesh's food and beverage sector as well. In terms of ***policy development for supply chain stability***, the research critically focuses on the role of government interventions. It ensures the food security and supply chain residence regarding economic and environmental risk.

5.5 Future Work

Future studies should integrate primary data collection through surveys and interviews with supply chain managers in Bangladeshi food and beverage companies. This will provide a deeper look into risk mitigation and real-world challenges strategies. Additionally, digital transformation and industry 4.0 technology, including IoT, blockchain artificial intelligence, hold immense potential for improving transparency, preventing fraud or cyber threats forecasting demand within the food supply chain (Abideen et al., 2021). However, climate adaptation strategies also require the exploration through different longitudinal studies which assess the impact of climate change on specific agricultural inputs, transportation logistics and crop yields. This insight will aid in developing trust-adaptive supply chain models.

Furthermore, an analysis of governance and policy structure, including government regulation of food safety laws and international trade agreements, will help evaluate their effects on customer protection and supply chain stability in Bangladesh. Comparative regional studies offer valuable benchmarking insight by examining how other developed nations handle similar sup-ply chain-related risk, providing appropriate recommendations for Bangladeshi improvement. Lastly, quantitative risk modelling using machine learning algorithms and simulation tools could increase risk anticipation and scenario planning for stakeholders in the beverage and food industry. This ensures better preparedness for future disruptions. These areas of research will significantly contribute to motor rising and strengthening the Bangladesh supply chain system.

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