



Strategies for Performance Optimization: Risk Mitigation in Tourism Supply Chains of Indonesia

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ABSTRACT

In the context of optimizing performance, the tourism industry has great potential as a source of income for regions and countries. One area that has great potential in the tourism industry is Rembang Regency, Central Java, Indonesia. However, this industry is also vulnerable to various risks, such as natural disasters, pandemics, and security issues. Therefore, this research aims to identify risks in the tourism industry supply chain in Rembang Regency and develop effective mitigation strategies. The research method used is decision matrix risk assessment (DMRA), which involves supply chain mapping, risk identification, risk assessment, risk response development, and risk response control. The results of identifying risks that need to be mitigated from travel agents to tourist activities include fluctuating products/services, incompatibility with tourist destinations, and failure in promotional programs. Meanwhile, stakeholder activities in the tourism industry include failure in formulating policies and promotional programs. Proposed mitigation measures include diversifying supply chains, improving communication between suppliers and the tourism industry, and developing flexible policies. Implementation of this strategy is expected to strengthen the tourism industry supply chain in Rembang Regency, improve the tourist experience, and support sustainable economic growth. Risk mitigation in the tourism industry also contributes to the performance of the tourism industry and the achievement of sustainable development goals (SDGs) by providing benefits to the environment, economy, and local communities.

Keywords: *Tourism Industry, Performance, Supply Chain, Risk Mitigation, Decision Matrix Risk Assessment*

1. Introduction

The tourism industry has great potential to generate income for regions and countries (Higgins-Desbiolles, 2020; Camilleri., 2018). This has encouraged several regions to increase tourism industry activities as one of the leading sectors for improving the regional economy. The tourism industry covers various segments such as leisure, business and adventure tourism, with a focus on products and services such as accommodation, transportation and attractions (Abbas et al., 2021; Camilleri et al., 2018). This sector contributes significantly to GDP and creates jobs, as well as having a positive impact on related industries. Sustainability and regulatory aspects governing tourism are also important to ensure environmentally and socially friendly development. Significant economic contributions are obtained through expenditures generated by tourists in various aspects of their travel, including transportation tickets, accommodation, food consumption, and other tourism services (Subawa et al., 2021). Income generated from the tourism sector also creates jobs directly and indirectly, involving sectors such as transportation, accommodation, restaurants, and the local creative and craft sector. In addition, the tourism industry encourages local economic growth through investment in tourism infrastructure, such as airports, roads, and other tourist facilities. Moreover, tourism multiplies other sectors, such as agriculture and manufacturing, by increasing demand for local products and fostering regional economic diversification. Therefore, the tourism industry is a significant source of income and a catalyst that drives sustainable economic growth.

One of the regions in Indonesia that is starting to look at the tourism industry as a strategy to improve the regional economy is Rembang Regency, Central Java, Indonesia (Achmad et al., 2023a). Rembang Regency, Central Java, Indonesia, has promising tourism potential, ranging from natural, religious, artificial, cultural, and culinary (Achmad et al., 2023b; Kurniati et al., 2024). The tourism industry in Rembang Regency, Central Java, has unique and diverse characteristics, making it one of the leading sectors in the local economy. Rembang offers a variety of attractions, including natural beauty, cultural sites, and distinctive local cuisine. Natural attractions, including beaches, mountains, and green areas, provide opportunities for nature tourism activities (Suroija et al., 2022). At the same time, cultural sites such as temples and historical relics attract tourists who want to explore cultural heritage. Tourists visiting Rembang consist of various demographics, ranging from domestic to international tourists, who are interested in enjoying authentic and local experiences. The contribution of the tourism industry to the regional economy can be seen from the increase in local community income, job creation, and encouragement of related sectors such as transportation, accommodation, and the creative industry.

However, the tourism industry in Rembang Regency is also highly vulnerable to various forms of risk, such as natural disasters, political instability, pandemics, and security threats (Kyrylov et al., 2020), which can cause disruption to supply chains and cause damage to businesses and destinations (Zielinski et al., 2020; Wahyuningtyas et al., 2020). The study by Kim et al. (2018) shows that increasing the number of tourists can cause environmental damage in tourism destinations, such as damage to coral reefs, deforestation, and increased waste. One significant risk is the risk in the tourism supply chain. The tourism supply chain involves various parties, including transportation providers, accommodation, restaurants, and tourist attractions (Achmad et al., 2023d). If one party experiences a problem, this can impact the entire supply chain and the tourism industry. To overcome risks and ensure business continuity in the tourism industry, risk mitigation has become an important practice for stakeholders in the tourism industry (González-Torres et al., 2021; Jermisittiparsert et al., 2019; Mandal and Dubey, 2020).

Risk mitigation refers to proactive actions to reduce the likelihood or impact of a potential risk (González-Torres et al., 2021). In the tourism industry, risk mitigation can take many forms, such as developing contingency plans, diversifying supply chains, adopting new technologies, and collaborating with stakeholders to share risks (González-Torres et al., 2021; Jermisittiparsert et al., 2019; Mandal Dubey 2020; Achmad et al., 2024). Competence in effectively handling unexpected risks from the supply chain will provide a strategic competitive advantage in creating added value for customers (Leuschner et al., 2014; Sriwana et al., 2022). Several studies have examined various aspects of risk mitigation in the tourism industry. These risk mitigation practices have been very successful and can be beneficial if implemented.

Previous studies have examined how the increasingly agile and dynamic industrial world can increase company risks. An *agile industry* is defined as an industry that can adapt quickly to changes in the market, technology, and regulations. However, with this flexibility comes a series of risks that companies must face. According to Ferreira et al. (2021), as industries become more agile, supply chains become more complex and vulnerable to disruption, whether due to demand uncertainty, dependence on suppliers, or sudden changes in regulations. They found that adapting to changing market dynamics requires more proactive risk mitigation, especially in managing supply chain variability. Centobelli et al. (2020) added that companies operating in an agile environment often face risks such as supply chain instability and rapid technological change. These risks can cause uncertainty in production planning, fluctuations in raw material prices, and increased operational costs (Centobelli et al., 2020). Companies must respond more quickly to changes, which can lead to operational instability without good risk management. Tohānean et al. (2020) argued that in a strategic context, companies operating in constantly evolving and innovative industrial environments must be adept at managing risks associated with technological innovation and market disruption (Tohānean et al., 2020). They emphasized the crucial role of managerial ability in developing flexible and adaptive strategies to mitigate these risks. They found that companies that fail to adapt quickly often see a decline in their competitiveness (Tohānean et al., 2020).

From several previous research references, risk mitigation in the supply chain in the tourism industry can focus on the impact of the Covid-19 pandemic and the role of stakeholders in implementing (Liu et al., 2021; Zainafree et al., 2021; Fong et al., 2019). Therefore, the main objective of this study is to identify the main risks in the tourism industry supply chain in Rembang Regency and develop effective mitigation strategies. Rembang Regency, one of the areas with large natural and cultural tourism potential in Central Java, has a

complex and integrated tourism ecosystem. In recent years, the development of the tourism sector in Rembang has faced various challenges, including fluctuations in the number of tourist visits, limited infrastructure, and climate change that affects the appeal of natural tourism. In addition, Rembang Regency is a developing area in terms of tourism infrastructure, so it is essential to understand how various parties, such as travel agents, tourist destination managers, local governments, and local communities, play a role in risk management (Rizaldi et al., 2022). Specifically, this study seeks to identify various significant risks that affect the supply chain, starting from travel agents and tourist destinations to other stakeholders in the tourism sector. In addition, this study also aims to develop a mitigation strategy based on a supply chain risk management (SCRM) framework that stakeholders in the tourism sector can practically implement. By knowing the risks of the supply chain as a whole, we can avoid losses from a social, economic, and environmental perspective (Abrar et al., 2018; Haraguchi et al., 2016; Becken et al., 2013; Achmad and Wiratmadja, 2024).

The contributions of this research are very diverse. First, this paper can comprehensively answer and reference various studies for empirical research on SCRM in the tourism industry. Second, increasing the value added to tourists in the Rembang Regency tourism industry by identifying risks and challenges in the supply chain. Third, risks that arise in the tourism industry supply chain must be identified, and effective prevention methods to reduce risks should be developed using a risk assessment matrix approach. The tourism industry can build a more resilient and sustainable supply chain by taking these steps while minimizing negative impacts on local communities. Risk mitigation in the tourism industry is closely related to the Sustainable Development Goals (SDGs), which is very important because a sustainable tourism industry can greatly benefit the environment, economy, and society (Cabello et al., 2021).

2. Literature Review

2.1. Tourism Industry

The tourism sector comprises a network of interconnected enterprises engaged in the provision of goods and services tailored to meet the requirements of travelers in facilitating tourism activities (Septiningrum et al., 2023). The tourism industry is linked to several other sectors because tourism is said to be a combination of phenomena and reciprocal relationships (Subawa et al., 2021; Achmad et al., 2023a). This phenomenon involves a variety of actors, including service providers such as accommodation, transportation, restaurants, tourist attractions, travel agents, and governments responsible for regulating and managing this industry. The growth of the tourism industry has become a significant global phenomenon in recent decades, driven by various factors, including increased human mobility, advances in transportation technology, as well as increasing awareness of the importance of travel and exploration for personal and social development (Subawa et al., 2021; Achmad et al., 2023a) Abbas et al., 2021; Kholizah et al., 2023). As a result, the demand for tourism experiences is increasing, making a significant contribution to the economic growth of a country or region (Zulkarnain et al., 2023; Achmad et al., 2023f). Achmad et al., 2023f. Apart from directly contributing to a region's income through tourist spending, this industry also promotes cultural exchange, cross-cultural understanding, and the development of infrastructure and supporting services that can improve the quality of life of local communities.

2.2. Tourism Supply Chain

A supply chain perspective in the tourism sector is necessary for increased coordination and operational effectiveness. The tourism supply chain refers to the network of organizations, people, activities, resources, and information involved in the production, distribution, and delivery of tourism products and services (González-Torres et al., 2021; Leuschner et al., 2014; Sriwana et al., 2021; Leuschner et al., 2014; Sriwana et al., 2022). The tourism supply chain is highly complex, involving multiple stakeholders, including tour operators, travel agents, transport companies, accommodation providers, destination management organizations, and other service providers. The tourism supply chain is diverse because it consists of very heterogeneous units, namely hotels, restaurants, travel agencies, and souvenir shops that provide goods and services to tourists (Achmad et al., 2023b). Travelers have the opportunity to procure integrated tourism packages either directly from tour operators or through intermediary travel agencies. Alternatively, they retain the flexibility to independently arrange their travel arrangements by procuring individual tourism components, including airfare and accommodations. Consequently, the TSC may be perceived as an amalgamation of diverse supply channels encompassing lodging, transportation services for passengers, and culinary offerings, among others (Tapper & Font, 2004).

2.3. Supply Chain Risk Management

Supply Chain Risk Management (SCRM) is a systematic approach to identifying, evaluating, and managing risks in an organization's supply chain. This concept is essential in economic globalization, where supply chains often involve many parties from various countries and are associated with complex risk factors (Achmad et al., 2023g). SCRM aims to minimize the negative impact of these risks on business operations, financial performance, and company reputation. SCRM involves developing mitigation strategies to manage identified risks (González-Torres et al., 2021). This strategy can include various approaches, ranging from diversification of the supply chain, increasing visibility and transparency, using information technology for risk monitoring and control, and establishing partnerships with suppliers and other stakeholders to share risks.

A critical aspect of SCRM is the identification of potential risks that can affect the supply chain, including operational, financial, environmental, security, and geopolitical risks. After identification, the next step is to evaluate the impact and probability of the risk occurring. This involves an in-depth analysis of each risk to understand the potential harm it may cause and how likely it is to occur (Domínguez et al., 2019; Marhavilas et al., 2008). Risks in the supply chain are divided into three categories (Domínguez et al., 2019), namely:

- Internal risks, where the supplier company has control, disruption of a process, and control risks such as errors in implementing the rules set by an organization.
- The organization's external risks include demand risk (disruption of the flow of products and information related to downstream processes) and supply risk.
- External supply chain risks, including environmental risks that affect downstream and upstream processes.

3. Methodology

In this research, the proposed methodology is founded upon the Decision Matrix Risk Assessment (DMRA) technique, employing a descriptive analytical framework to discern and evaluate risks associated with each operational facet within the supply chain (Domínguez et al., 2019). DMRA is a systematic approach to risk estimation that involves measuring and categorizing risks based on information considerations, both in terms of probability and consequences and relative importance (Domínguez et al., 2019; Marhavilas et al., 2008). DMRA's quantitative and graphical methods can help stakeholders prioritize and manage critical risks (Marhavilas et al., 2008). Figure 1 is the flow of the stages of the Decision Matrix Risk Assessment technique.

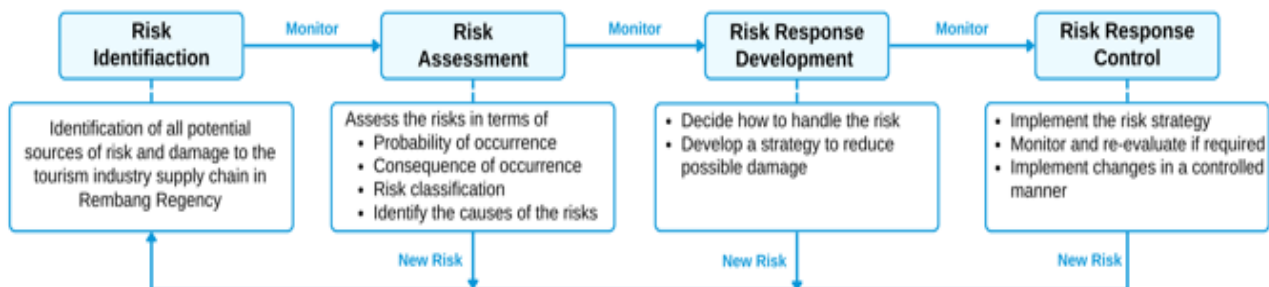


Figure 1. Research stages use Decision Matrix Risk Assessment.

Figure 2 explains the steps in using the decision matrix risk assessment technique.

- Supply chain mapping: The first step in this research is mapping the supply chain in the Rembang Regency tourism industry, which will be used to identify risks at each stage.
- Risk identification: The second phase involves a comprehensive elucidation of potential risks prevalent in the tourism industry.
- Risk assessment: The third phase involves the meticulous calculation of risks, taking into account both probability and impact values, and subsequent categorization through a structured risk assessment process.
- Risk response development: The fourth step is to develop a risk response that will provide mitigation proposals for the highest-ranked risks.
- Risk response control: The final phase revolves around the management of risk responses, entailing the implementation and vigilant monitoring of the devised mitigation strategies to ensure effectiveness and adaptability.

DMRA is a powerful tool that helps organizations identify, evaluate, and manage risks in a structured and systematic manner. By using this approach, organizations can be more effective in making informed decisions about the potential risks they face.

This research was conducted in the Tourism Industry of Rembang Regency, Central Java, Indonesia, because it has a lot of tourism potential that supports tourism industry activities. Sample selection was conducted on Micro, Small, and Medium Enterprises (SMEs) operating in the tourism sector in Rembang, including food and beverage businesses, accommodation, transportation, antique markets, crafts, fashion, and performing arts. SMEs play a key role in the tourism industry, especially in areas that rely on the sector as an economic driver. The SME sample in this study is significant because they directly contribute to the tourist experience by providing various services and products, such as accommodation, culinary, and local crafts. By involving SMEs, this study can dig deeper into the specific challenges and risks faced by business actors at the local level and identify relevant mitigation strategies. In addition, SMEs often represent local culture and traditions, making them a critical component in attracting tourists and creating authentic experiences. Data were collected through direct observation methods to understand the dynamics of the tourism industry, in-depth interviews with SME owners to gain information on the challenges and risks faced, and brainstorming sessions with local SME and tourism coordinators. In addition, a literature review was also conducted to increase insight into risk mitigation in the tourism industry and define existing risks through cross-validation. Data analysis was conducted using qualitative and quantitative approaches, where data from interviews and observations were analyzed using thematic analysis techniques to identify patterns and themes related to risk. Furthermore, quantitative data from risk assessments will be analyzed using the DMRA method, which provides a clearer picture of existing risks and their mitigation priorities.

4. Result and Discussion

4.1. Supply Chain Mapping

Mapping actors in each activity stage and optimal allocation of resources in the tourism industry is the primary strategy to ensure adequate supervision of the distribution process of tourism services and products to customers. This process also facilitates routine evaluation and continuous improvement at every operational stage in the tourism industry. Through this approach, it is hoped that the tourism industry can reduce internal risks and strengthen its reputation as a leader in the tourism industry in terms of service. The development of the supply chain model is based on observational data analysis and an in-depth understanding of the business processes that occur in the tourism industry (Achmad et al., 2023d), as explained in Figure 2.

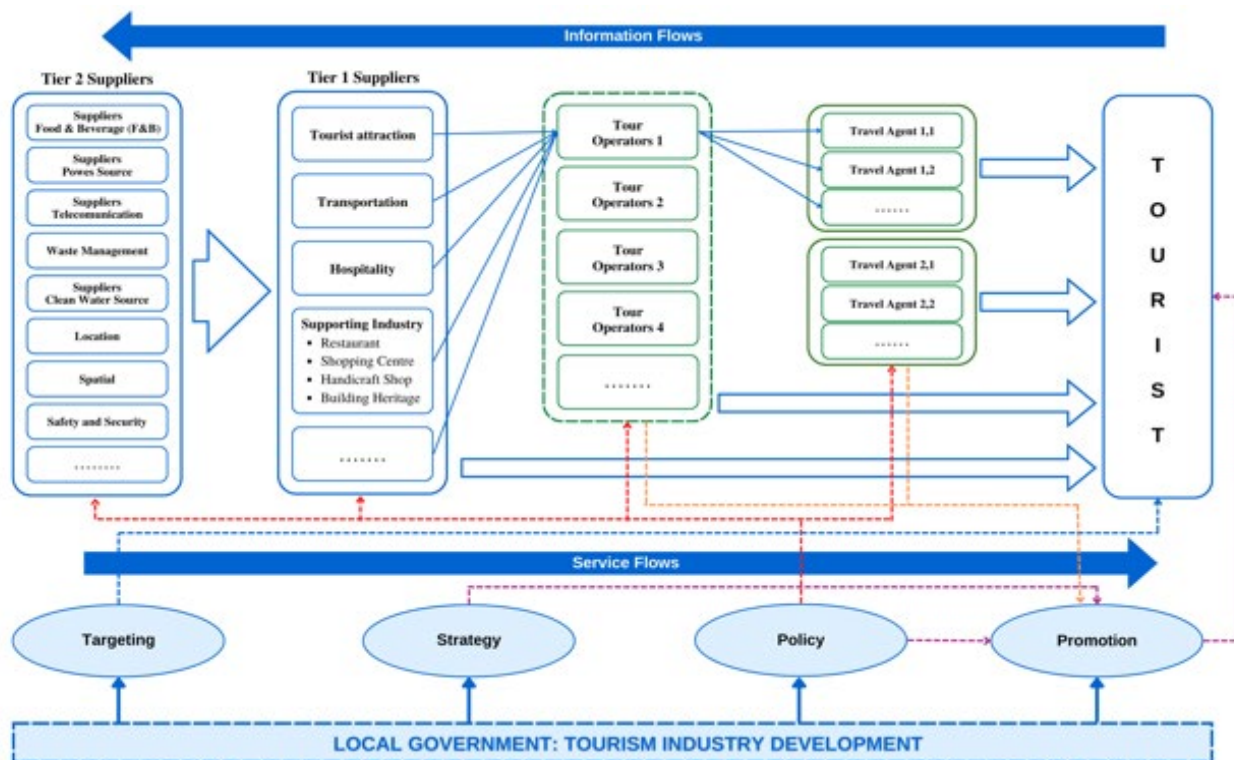


Figure 2. Supply Chain Tourism Industry di Rembang Regency
Source: Achmad F et. Al., 2023

Figure 2 shows that supply chain mapping in the tourism industry is a process that involves various levels of suppliers involved in providing the services and products needed to carry out tourist trips. At the tier 2 supplier level, several categories of suppliers play a crucial role, such as suppliers of food and beverages, energy resources, communication services, clean water, waste management, and physical infrastructure. They all contribute to essential aspects of the traveler experience, such as food, transportation, and travel comfort. Furthermore, at the tier 1 supplier level, some leading suppliers provide services and facilities that are more directly related to the tourist experience. This includes tourist attractions, transportation, accommodation, and other supporting services such as restaurants and shopping centers. Suppliers at this level are responsible for critical aspects of travel, including destinations, transportation, and comfortable lodging. In addition, there are other levels in the tourism industry supply chain, including tour operators and travel agents. Tour operators plan and run tourist trips, while travel agents are intermediaries between tourists and tourism service providers. Ultimately, tourists are the final consumers of all services and products suppliers provide in the supply chain.

No less important, in this supply chain flow, parties such as local government and stakeholders play a role in regulating and formulating strategies, policies, and promotions to sustainably develop the tourism industry and optimize the tourist experience (Ramadhan et al., 2024; Achmad et al., 2023d). Their existence plays a crucial role in managing and supporting the smooth operations and growth of the tourism industry. In this way, supply chain mapping provides a comprehensive picture of the interconnections between the various parties involved in organizing a tourist trip, which is critical in ensuring a satisfying experience for travelers.

4.2. Risk Identification

In evaluating risks, understanding the origins of the risk and the events that can trigger it is important. Risk identification is undertaken to discern and evaluate potential hazards that could manifest within a project or undertaking, encompassing the compilation of risk-related data from diverse outlets and subsequent analysis thereof (Nugraha et al., 2022). Focus of our study is on risks that are more directly manageable within the scope of the tourism supply chain (Shen et al., 2022). While natural disasters are undeniably significant, they fall under broader environmental risks that are largely beyond the direct control of individual entities in the supply chain. Instead, our study concentrates on operational and supply chain risks where mitigation strategies can be more readily implemented by stakeholders. In the supply chain, supplier-to-supplier relationships are critical to maintaining smooth operations in the tourism industry. Late payments and breach of contract are two common issues that can disrupt the flow of goods and services. Late payments often occur due to internal financial issues or market instability, which ultimately reduce supplier liquidity, hinder their ability to fulfill orders on time, and trigger delays throughout the supply chain. On the other hand, a breach of contract occurs when there is a mismatch between performance expectations and actual results, either due to unclear contracts, non-compliance with agreed regulations, or failure of suppliers to meet service and product specifications. These issues can worsen supplier relationships, resulting in reduced quality, delayed deliveries, and additional risks in the tourism supply chain. Subsequently, Table 1 delineates the process of risk identification at every stage of the supply chain within the tourism sector.

Table 1. Identification of Risk Types in the Tourism Industry Supply Chain.

Activity	Risk Identification	Source of Risk
Supplier to Supplier	Product delivery failure	Problems from various factors, such as logistics problems, negligence in shipping planning
	Violation of employment contract	Unclearness in contracts, mismatch between expectations and performance, or non-compliance with established regulations
	Late payment	Internal company financial problems, market instability, or non-compliance with established payment procedures
	Failure to meet facility and service specifications	Errors in communication between suppliers and the tourism industry or problems in production or service processes
	Products/facilities from suppliers do not pass quality control	Lack of quality control from suppliers or problems in the production process that were not detected before delivery.
	Product delivery is late	Delays in the production process, logistics problems, or disruptions in the supply chain
	The product/service does not	errors in the ordering or communication process, lack of

Activity	Risk Identification	Source of Risk
	match the order	clarity in the specifications of the product or service requested, or problems in the production or service process by the supplier
Supplier to Tour Operator	Fluctuating product prices	Sudden changes in prices of raw materials or product components can affect operational costs and profitability of tour operators
	Violation of employment contract	violation of the terms of the employment contract between the supplier and the tour operator
	Product delivery failure	The ordered product was not successfully delivered on time to the tour operator
	Product delivery is late	The ordered product was not delivered according to the specified schedule
	The product/service does not match the order	errors in understanding or communication regarding requested product/service specifications, lack of quality control from suppliers
Supplier to Tourist	Fluctuating product prices	Changes in raw material prices, fluctuations in currency exchange rates, or unexpected changes in market conditions
	Miscalculation of product demand	Inaccurate demand estimates, or a mismatch between demand estimates and market reality
	Violation of employment contract	Both parties did not comply with the provisions agreed in the employment contract
	There is no permission from stakeholders	Failure to obtain required permits or approvals from related parties
	Product delivery failure	The product or service ordered is unsuccessful due to logistical problems or negligence in delivery planning
	Product delivery is late	The product or service ordered is not delivered according to the specified schedule
	Failure in promotional programs	Promotional programs are ineffective in attracting tourist interest, errors in promotional strategies, lack of funding, or mismatch with tourist preferences
	Forecasting tourist visits	Errors in predicting the number of tourists who will visit
	Incompatibility of tourist destinations	Tourist destinations do not match the image or content marketed to tourists
	Fluctuating product prices	Fluctuations in product or service prices that are influenced by changes in market conditions or production costs.
Tour Operator to Travel agent	Miscalculation of service demand	Errors in forecasting and estimating demand for tourist services from travel agents
	Violation of employment contract	violation of the terms of the employment contract between the two parties
	There is no permission from stakeholders	Failure to obtain required permits or approvals from related parties
	Product delivery failure	The product or service ordered is unsuccessful due to logistical problems, or negligence in delivery planning
	Product delivery is late	The product or service ordered is not delivered according to the specified schedule
	Failure in promotional programs	Promotional programs are ineffective in attracting tourist interest, errors in promotional strategies, lack of funding or mismatch with tourist preferences
	Incompatibility of tourist destinations	Tourist destinations do not match the image or content marketed to tourists
Travel Agent to Tourist	Fluctuating product/service prices	Fluctuations in product or service prices that are influenced by changes in market conditions or production costs.
	Errors in demand calculations	Errors in forecasting and estimating demand for tourist services from travel agents
	Incompatibility of tourist	The tourist destinations chosen by travel agents do not

Activity	Risk Identification	Source of Risk
Stakeholder to Tourism Industry	destinations	match tourists' preferences or expectations
	Dirty tourism places and facilities	The tourist attractions or facilities provided are not kept clean properly
	Failure in promotional programs	Promotional programs are ineffective in attracting tourist interest, errors in promotional strategies, lack of funding or mismatch with tourist preferences
	Tourist complaints	Tourists experience dissatisfaction or problems during their trip and submit complaints to the travel agent
	Delay in submitting criticism	Travel agents fail to convey criticism or input from tourists to related parties in a timely manner
	Failure to formulate policies	The policies formulated do not properly take into account the dynamics of the tourism industry
	Policies do not meet targets	the policies set are not in accordance with the goals or targets that have been set
	Shortfalls and excesses in the operational budget	The operational budget is insufficient to support tourism industry activities or when there is waste in the use of the budget
	Facilities do not match the characteristics of tourist attractions	The facilities provided are not in accordance with the characteristics or needs of tourist attractions
	Tourism technical planning is not yet ready	Technical planning for the development or maintenance of tourism infrastructure is immature or incomplete
	The tourism layout is less strategic	The layout or physical arrangement of tourist attractions does not take into account strategic aspects such as accessibility, security or efficient use of space
	Failure in promotional programs	Promotional programs are ineffective in attracting tourist interest, errors in promotional strategies, lack of funding or mismatch with tourist preferences
	Errors in forecasting tourist visits	Errors in predicting the number and pattern of tourist visits
	Incompatibility of tourist destinations with content	Tourist destinations do not match the image or content marketed to tourists

4.3. Risk Assessment

The subsequent phase in risk management involves risk assessment, with the primary objective being the evaluation of risks predicated upon their likelihood of occurrence and potential impacts. Additionally, risk assessment entails the formulation of scenarios to gauge the ramifications of identified risks (Nugraha et al., 2022). The paramount aim of risk assessment is to ascertain that the risk mitigations implemented for the processes, operations, or activities undertaken are maintained at an acceptable level of risk. Within risk assessment, the two principal criteria utilized are Likelihood and Consequence. The Likelihood criteria are delineated in Table 2, while the Consequence criteria are expounded upon in Table 3.

Table 2. Qualitative Measures of Likelihood

Level	Likelihood	Description
A	Almost certain	An event will occur in all conditions / every activity carried out.
B	Likely	An event is likely to occur in almost any condition
C	Possible	An event will occur under certain conditions.
D	Unlikely	An event may occur under certain conditions, but it is unlikely that it will occur.
E	Rare	An incident may occur in a special condition / extraordinary / after many years.

Table 3. Qualitative Measures of Consequence

Level	Consequence	Description
1	Insignificant	Low financial loss, no injuries
2	Minor	Medium financial loss, first aid treatment, on-site release immediately contained
3	Moderate	High financial loss, medical treatment required on-site release contained with outside assistance
4	Major	Major financial loss, extensive injuries, loss of production capability, off-site release with no detrimental effects
5	Catastrophic	Huge financial loss, death, toxic release off-site with detrimental effect

Table 4. Risk Matrix Likelihood and Consequence

		Consequence				
Likelihood		1	2	3	4	5
A	High	High	High	Extreme	Extreme	Extreme
B	Moderate	High	High	High	Extreme	Extreme
C	Low	Moderate	High	High	Extreme	Extreme
D	Low	Low	Moderate	High	High	Extreme
E	Low	Low	Moderate	High	High	High

Information: extreme : extreme risk; immediate action required
high : high risk; senior management attention needed
moderate : moderate risk; management responsibilities must be determined
low : low risk; manage with routine procedures

This risk matrix categorizes risks into four levels, namely extreme, high, moderate, and low. The analysis uses the matrix in Table 4 to differentiate between acceptable small risks and risks with the potential for significant losses. Mapping this type of risk also provides data to help evaluate and manage risks. Each potential solution to each identified risk needs to be assessed, and the success of decisions in the tourism industry before addressing a particular risk is considered during this evaluation process. Supply chain information throughout the tourism industry is obtained by conducting field surveys and collecting data on the tourism industry and possible risks at each stage.

Subsequently, the subsequent phase involves establishing the context and delineating the fundamental parameters under which risks are to be managed and addressed to facilitate informed decision-making. The magnitude of an event's impact, the likelihood of the event occurring, and its consequences on the tourism industry are assessed in the context of existing controls. However, due to the unavailability of relevant past data in the tourism industry, a subjective approach may be used to measure an individual's or group's level of confidence that a particular event or outcome will occur. According to Leuschner et al. (2014), in carrying out a semi-quantitative analysis for each description, an accurate relationship with the magnitude of the consequences in the tourism industry is not required. The numbers can be combined with a series of formulas, provided that the system used to determine priorities corresponds to the approach chosen to generate and combine the numbers. The objective is to enhance prioritization beyond the typical outcomes attained in qualitative analysis. The risk scoring in this study was developed through discussions with experts in the tourism industry in Rembang Regency. These experts have in-depth knowledge and experience in managing various risks within the tourism supply chain, ensuring that the risk identification and scoring process is grounded in practical, real-world insights. By involving local industry experts, the scoring becomes more valid and reliable, reflecting regional stakeholders' actual conditions and challenges. Furthermore, the collaboration with these experts helps to minimize bias and ensures that the assessment is based on a comprehensive understanding of the specific risks in the tourism industry. By referring to Table 1, the identification of risk categories to be mapped has been accomplished through an assessment of both likelihood (L) and consequences (C), culminating in the derivation of a risk rating for each activity within the supply chain, as depicted in Table 5.

Table 5. Risk Assessment of the Tourism Industry Supply Chain

Activity	Risk Identification	Source of Risk	L	C	Risk Rating
Supplier to Supplier	Product delivery failure	Problems from various factors, such as logistics problems, negligence in shipping planning	B	3	High
	Violation of employment contract	Unclearness in contracts, mismatch between expectations and performance, or non-compliance with established regulations	D	2	Low
	Late payment	Internal company financial problems, market instability, or non-compliance with established payment procedures	C	3	High
	Failure to meet facility and service specifications	Errors in communication between suppliers and the tourism industry, or problems in production or service processes	C	2	Moderate
	Products/facilities from suppliers do not pass quality control	Lack of quality control from suppliers, or problems in the production process that were not detected before delivery.	C	2	Moderate
	Product delivery is late	Delays in the production process, logistics problems, or disruptions in the supply chain	B	3	High
	The product/service does not match the order	errors in the ordering or communication process, lack of clarity in the specifications of the product or service requested, or problems in the production or service process by the supplier	C	2	Moderate
Supplier to Tour Operator	Fluctuating product prices	Sudden changes in prices of raw materials or product components, which can affect operational costs and profitability of tour operators	C	2	Moderate
	Violation of employment contract	violation of the terms of the employment contract between the supplier and the tour operator	D	2	Low
	Product delivery failure	The ordered product was not successfully delivered on time to the tour operator	B	3	High
	Product delivery is late	The ordered product was not delivered according to the specified schedule	C	3	High
	The product/service does not match the order	errors in understanding or communication regarding requested product/service specifications, lack of quality control from suppliers	B	3	High
Supplier to Tourist	Fluctuating product prices	Changes in raw material prices, fluctuations in currency exchange rates, or unexpected changes in market conditions	B	3	High
	Miscalculation of product demand	Inaccurate demand estimates, or a mismatch between demand estimates and market reality	C	2	Moderate
	Violation of employment contract	Both parties did not comply with the provisions agreed in the employment contract	D	2	Low
	There is no	Failure to obtain required permits or	E	2	Low

Activity	Risk Identification	Source of Risk	L	C	Risk Rating
	permission from stakeholders	approvals from related parties			
	Product delivery failure	The product or service ordered is unsuccessful due to logistical problems, or negligence in delivery planning	B	3	High
	Product delivery is late	The product or service ordered is not delivered according to the specified schedule	C	3	High
	Failure in promotional programs	Promotional programs are ineffective in attracting tourist interest, errors in promotional strategies, lack of funding or mismatch with tourist preferences	B	2	High
	Forecasting tourist visits	Errors in predicting the number of tourists who will visit	C	2	Moderate
	Incompatibility of tourist destinations	Tourist destinations do not match the image or content marketed to tourists	C	2	Moderate
Tour Operator to Travel agent	Fluctuating product prices	Fluctuations in product or service prices that are influenced by changes in market conditions or production costs.	C	2	Moderate
	Miscalculation of service demand	Errors in forecasting and estimating demand for tourist services from travel agents	C	3	High
	Violation of employment contract	violation of the terms of the employment contract between the two parties	D	2	Low
	There is no permission from stakeholders	Failure to obtain required permits or approvals from related parties	E	2	Low
	Product delivery failure	The product or service ordered is unsuccessful due to logistical problems, or negligence in delivery planning	C	3	High
	Product delivery is late	The product or service ordered is not delivered according to the specified schedule	C	3	High
	Failure in promotional programs	Promotional programs are ineffective in attracting tourist interest, errors in promotional strategies, lack of funding or mismatch with tourist preferences	B	2	High
	Incompatibility of tourist destinations	Tourist destinations do not match the image or content marketed to tourists	D	2	Low
Travel Agent to Tourist	Fluctuating product/service prices	Fluctuations in product or service prices that are influenced by changes in market conditions or production costs.	B	4	Extreme
	Errors in demand calculations	Errors in forecasting and estimating demand for tourist services from travel agents	C	3	High
	Incompatibility of tourist destinations	The tourist destinations chosen by travel agents do not match tourists' preferences or expectations	C	4	Extreme
	Dirty tourism places	The tourist attractions or facilities	B	3	High

Activity	Risk Identification	Source of Risk	L	C	Risk Rating
	and facilities	provided are not kept clean properly			
	Failure in promotional programs	Promotional programs are ineffective in attracting tourist interest, errors in promotional strategies, lack of funding or mismatch with tourist preferences	A	3	Extreme
	Tourist complaints	Tourists experience dissatisfaction or problems during their trip and submit complaints to the travel agent	C	2	Moderate
	Delay in submitting criticism	Travel agents fail to convey criticism or input from tourists to related parties in a timely manner	C	1	Low
Stakeholder to Tourism Industry	Failure to formulate policies	The policies formulated do not properly take into account the dynamics of the tourism industry	B	4	Extreme
	Policies do not meet targets	the policies set are not in accordance with the goals or targets that have been set	C	2	Moderate
	Shortfalls and excesses in the operational budget	The operational budget is insufficient to support tourism industry activities or when there is waste in the use of the budget	C	3	High
	Facilities do not match the characteristics of tourist attractions	The facilities provided are not in accordance with the characteristics or needs of tourist attractions	C	3	High
	Tourism technical planning is not yet ready	Technical planning for the development or maintenance of tourism infrastructure is immature or incomplete	C	3	High
	The tourism layout is less strategic	The layout or physical arrangement of tourist attractions does not take into account strategic aspects such as accessibility, security or efficient use of space	E	3	Moderate
	Failure in promotional programs	Promotional programs are ineffective in attracting tourist interest, errors in promotional strategies, lack of funding or mismatch with tourist preferences	A	3	Extreme
	Tourist forecasting errors	Errors in predicting the number and pattern of tourist visits	D	1	Low
	Incompatibility of tourist destinations with content	Tourist destinations do not match the image or content marketed to tourists	C	3	High

4.4. Risk Response Development

Risk response development entails the formulation and appraisal of strategies aimed at addressing the risks identified within the risk assessment matrix. This process aims to develop response strategies to the risks identified in the risk assessment matrix, reduce the impact of risks, increase the likelihood of success, optimize resources, and minimize costs. In the tourism industry context, risks like this are considered high. If left unchecked, this can cause work accidents or significant losses. Further risk response actions will be mapped based on the risk assessment matrix. Actions can use technological assistance (Ramadhan et al., 2023) and evaluate programs that have been implemented (Rizaldi et al., 2022). Based on the outcomes delineated in Table 5, four distinct risk classifications have been identified: extreme, high, moderate, and low. Upon

determining the risk rating, strategies to mitigate risks encompass risk retention, reduction, transfer, and avoidance. Referring to the risk matrix delineation, Table 6 illustrates that risk events categorized as extreme necessitate immediate attention to prioritize corresponding actions. The outcomes of risk mitigation measures can serve as a pivotal reference point for stakeholders within the tourism sector, notably the government of Rembang Regency, Central Java, allowing them to conduct a comprehensive analysis and policy-making on the security management system risks associated with every aspect of the tourism supply chain (Ramadhan et al., 2024).

Table 6. Extreme Level Risk Mitigation

Activity	Risk	Risk Mitigation
Travel Agent to Tourist	Fluctuating product/service prices	Portfolio diversification: Travel agents can expand the portfolio of products and services offered to customers, including tour packages at various prices to reduce dependence on certain products or services that may experience price fluctuations.
		Technology use: Utilize technology (social media, websites, etc.) to monitor and predict price changes, as well as provide the latest information to customers so they can make timely decisions.
	Incompatibility of tourist destinations	Destination filtering: Conduct thorough research regarding the tourist destinations offered to customers, including collecting actual information about the condition of the location, facilities and comfort of the destination.
		Collaboration with local partners: Building partnerships with local operators or tourism agents in destinations to ensure that the information provided to customers is accurate and in accordance with the reality on the ground.
Stakeholder to Tourism Industry	Failure in promotional programs	Careful planning: Carry out thorough promotional planning, including determining the right target audience, clear messages, and effective communication channels to ensure the effectiveness of promotional programs.
		Periodic evaluation: Conduct regular evaluations of promotional program performance, including measuring levels of customer engagement, market response, and financial impact, to identify failures or successes and make necessary changes
	Failure to formulate policies	Collaboration with marketing experts: Collaborate with marketing experts or consultants to assist in planning, implementing and evaluating promotional programs, as well as providing insights and suggestions that can increase promotional effectiveness.
		Interested party involvement: Involve various stakeholders, including local governments, tourism agencies, local communities, and industry experts, in the policy formulation process to ensure holistic representation and broad support.
		Risk analysis: Conduct a thorough risk analysis of the proposed policy, including identifying potential negative impacts,

Activity	Risk	Risk Mitigation
		implementation challenges, and uncertainties that may arise, and design appropriate mitigation strategies.
		Open communication: Establish open and transparent communication channels with all interested parties to discuss and obtain input regarding proposed policies, thereby enabling the identification of potential failures and necessary improvements.
		Comprehensive planning: Develop a comprehensive promotional plan with clear objectives, the right target audience, a compelling message, and adequate budget allocation, as well as considering the various promotional channels available.
	Failure in promotional programs	Strategic partnerships: Building strategic partnerships with advertising agencies, digital influencers, mass media and tourism promotion agencies to expand promotional reach and increase the effectiveness of promotional campaigns.
		Monitoring and evaluation: Conduct regular monitoring and evaluation of promotional program performance, including measuring the level of audience engagement, market response, and financial impact, as well as identifying failures or successes for future learning and improvement.

4.5. Risk Response Control

The next step in this research series involves controlling the response to risk, which includes implementing the risk strategy designed in the previous stage, followed by evaluation and monitoring of this implementation. The importance of monitoring actions taken related to risks is to ensure that changes in situations or conditions do not change previously determined risk priorities. The results of this risk evaluation can provide a solid basis for stakeholders to make the right decisions in managing existing risks. By adopting a comprehensive approach to controlling risk, it is hoped that the quality of the tourism industry's performance as a whole will experience significant improvement.

5. Conclusion

This research proposes a supply chain risk management (SCRM) framework that can be used to manage risks collaboratively and effectively. Implementing an SCRM-based risk management system in the tourism industry can help handle various challenges related to its supply chain. From the risk analysis results, 5 types of risks were identified that need to be prioritized to avoid harming the tourism industry. From travel agents to tourist activities, they include fluctuating products/services, incompatibility with tourist destinations, and failures in promotional programs. Meanwhile, stakeholder activities in the tourism industry include failure in formulating policies and promotional programs. Furthermore, in light of the increasing occurrence of natural disasters in tourist areas, it is essential to integrate disaster risk into the SCRM framework. The tourism industry must proactively incorporate disaster preparedness, mitigation, and response strategies to safeguard tourists and ensure the resilience of tourism operations. This addition will not only enhance the safety of visitors but also protect the industry's reputation and long-term sustainability. However, it should be noted that this study only presents risk mitigation recommendations based on the risk assessment carried out. To deepen understanding of the influence of SCRM, future research needs to develop more complex mathematical models to better represent supply chain networks, especially in the context of the tourism industry.

From this research, several implications can be considered. First, companies in the tourism industry can use

the risk assessment matrix method to identify risks more systematically and accurately. This approach will assist them in readiness to confront potential risks, thereby mitigating losses and adverse repercussions on business operations. Moreover, through the prioritization of risks according to their significance and influence on business operations, organizations can enhance their effectiveness in selecting suitable mitigation strategies, thereby improving efficiency in risk management and reducing associated costs. Lastly, by minimizing risk, companies in the tourism industry can improve their performance so that tourist satisfaction increases. The performance and quality of this service have a significant role in the tourism industry because they can directly impact tourist satisfaction and tourism image, which will ultimately help the tourism industry achieve a competitive advantage.

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