

Article

Enhancing Logistics Performance through Increased Trust and Collaboration in Supply Chain Risk Management: A Focus on the Distribution Network of Manufacturing Companies

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Abstract: This study aims to explore the significance of trust among companies within the supply chain and investigate its effect on collaborative supply chain risk management. In the current uncertain business environment, it is crucial for companies to establish trust relationships with their trading partners and collaboratively manage risks. This research seeks to understand how such trust relationships influence collaborative risk management and, subsequently, the effect of risk management collaboration on logistics performance. This study surveyed manufacturing companies in the Korean supply chain, and data were analyzed using SPSS 23.0 and AMOS 23.0. The results of this study imply that cognitive trust, related to the partner's expertise and capabilities, is more crucial than emotion-based affective trust in fostering collaborative supply chain risk management among companies within the supply chain, especially in the current unpredictable and complex business environments. Given the supply chain disruptions caused by uncertainties in the business environment, it is imperative to effectively manage risks and restructure the disrupted supply chain. Therefore, companies need to strive to demonstrate their expertise and capabilities to build cognitive trust and enhance logistics performance through supply chain risk management collaboration.

Keywords: cognitive trust; affective trust; supply chain risk management collaboration; buyer–supplier relationship; logistics performance



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1. Introduction

Contemporary companies operate in a rapidly changing competitive environment and rely on supply chain partners to provide accurate quantities of products in a timely manner under persistent cost and quality pressures. This has resulted in the need for an expanded supply chain network and increased the number of nodes within the supply chain system. The complexity of supply chains can facilitate operations, but directly affects risks associated with supply chain management, thereby undermining the supply chain [1]. Recently, due to various factors such as extreme weather events (wildfires in Australia, droughts in Somalia), economic risks (Brexit, United States–China trade conflicts), and Gray Rhinos (cyber-attacks, scientific technology, COVID-19), the global supply chain has become increasingly vulnerable, with frequent disruptions. According to data from Goldman Sachs Global Investment Research shown in Figure 1, supply chain risks have been steadily increasing over the past 30 years, leading to a decline in foreign direct investment. Hendricks and Singhal [2] reported that average corporate stock returns have decreased by 40% due to supply chain disruptions. As such, the management of continuously occurring supply chain disruptions has become as important as cost saving [3].

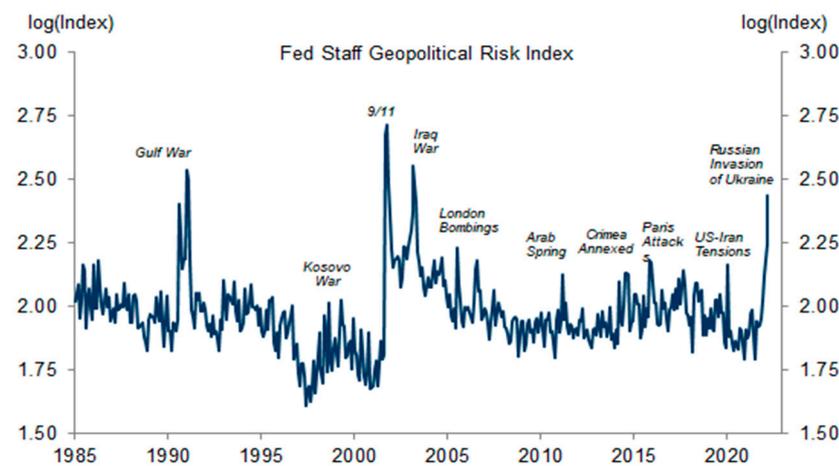


Figure 1. Fed Staff Geopolitical Risk Index (Source: Federal Reserve, Goldman Sachs Global Investment Research [4]).

Meanwhile, on 7 October 2022, the United States announced plans for semiconductor sanctions against the Chinese semiconductor industry. The United States and China are two pillars of the world economy, and their trade relations significantly affect the world economy. In particular, considering that the share of China in Korea's foreign direct investment is gradually decreasing in a situation where Korea's dependence on exports to China is high at 22.8%, it is likely that the status as a manufacturing leader will weaken in the future [5]. Therefore, it is imperative to consider how to retain our competitiveness in the current uncertain environment.

Examining the geopolitical risks influencing the supply chain in recent decades suggests a high likelihood of ongoing risks in the future, emphasizing the importance of proactive risk management to overcome such challenges [6–10].

Supply chain risk management involves identifying and assessing risks to reduce threats to the supply chain and implementing measures through coordination and collaboration among supply chain members [10]. In other words, risk management may be considered a systemic approach to managing the total flow of product inventory from suppliers to end customers, with a macroscopic view of the supply chain [11]. This system includes various departments within companies, external suppliers, and customers, and can optimize the production and distribution process through their trust and collaboration. Empirical research also indicates that collaborative relationships among members within the supply chain not only enhance the performance of businesses but also support the mitigation of industry-related risks [12]. Thus, while companies cannot entirely avoid risks, they can manage supply chain risks and minimize damages through collaboration with other companies within the supply chain.

According to previous studies, collaborative activities in supply chain risk management include information sharing, joint goal setting, collaborative decision-making, resource sharing, incentive sharing, risk sharing, vertical integration, supply chain diversification, and regional sourcing [10,13]. However, there is a lack of clear classification regarding the specific collaborative strategies in supply chain risk management that influence the performance of supply chain risk management. Therefore, this study aims to examine this in detail.

Despite the increasing recognition of the importance of collaboration among firms in the supply chain, adopting and implementing a framework for collaboration is not an easy task [14]. Most research on supply chain collaboration operates under the assumption that all supply chain partners will adopt collaboration with equal enthusiasm. However, this is often challenging in reality and can undermine the effectiveness of collaboration among supply chain partners. To address these challenges, a new approach to collaboration based on fairness and justice is needed [15], and trust among transaction partners is essential [16].

Furthermore, Kwon and Suh [17] emphasized that trust is a fundamental component when supply chain partners aim to maintain collaboration and enhance loyalty to contracts. In other words, trust serves as a prerequisite for a collaborative buyer–supplier relationship. Therefore, this study investigates how trust influences collaboration in supply chain risk management. This is important for a greater understanding of the factors constituting supply chain risk management collaboration.

Therefore, this study seeks to contribute to the supply chain risk management literature by examining the relationship between supply chain risk management collaboration and logistics performance as a single system, which may be established based on the two dimensions of trust appertaining to the flow systems proposed by Forrester [11].

The remainder of this paper is organized as follows. Section 2 presents a review of previous studies for each variable. Section 3 outlines the process of deducing the causal relationships between the variables and develops hypotheses. Section 4 presents the research methods and results for the research model, and Section 5 summarizes the research findings, discusses the implications, and suggests limitations and future research directions.

2. Theoretical Background

This study was initiated with the recognition of the importance of establishing efficient relationships among companies within the supply chain. It aims to examine the relationships between two dimensions of trust, supply chain risk management collaboration, and logistics performance. To achieve these objectives, a review of prior research on the key variables was conducted.

2.1. Trust

Trust, a subject of interest and exploration in various academic fields such as management and psychology within the social sciences, is essential for forming and maintaining relationships with transaction partners. In the field of management, research on trust has extended beyond interpersonal relationships to encompass trust between businesses. Companies that have established trust can efficiently achieve their goals and are motivated to act in the best interest of their partners' benefits as well as their own [18].

Recently, a significant amount of research has been conducted in the field of management on trust among companies within the supply chain. This is attributed to the recognition of trust as a crucial factor in the relationships and as a means to improve performance in businesses. For effective collaboration among companies, trust relationships must be established, and trust becomes especially vital in the early stages of cooperation [19]. Trust is considered the most effective means to reduce costs incurred during transactions and is an essential factor in building an effective supply chain [20]. In a similar context, Qian et al. [21] suggested that mutual trust is necessary to enhance the efficiency of the supply chain in the relationship between the supplier and buyer. In other words, there are various advantages to forming a relationship of trust with a counterpart, such as saving costs, increasing collaboration, and facilitating the sharing of information.

On one hand, trust is interpreted differently depending on the research objectives and the researchers. In the field of the supply chain, trust is studied as a multidimensional concept rather than a single dimension. More specifically, trust is categorized into cognitive trust, which is based on objective facts such as the partner's expertise and competence, and affective trust, which is based on emotional states toward partners [22,23].

Previous research has distinguished trust into cognitive and emotional aspects, suggesting that both objective attributes and emotion-based factors are necessary for determining the level of trust. Therefore, both cognitive and affective trust are considered essential to establish an effective and long-term relationship with transaction partners.

2.1.1. Cognitive Trust

Cognitive trust refers to a trust formed by the abilities of a counterpart, wherein abilities refer to competencies and skills [24]. Nyaga et al. [25] explained cognitive trust as

the willingness to believe in the abilities, skills, and competencies of a counterpart. They defined cognitive trust as the belief, grounded in rational knowledge, that a counterpart will perform tasks efficiently. Additionally, Ha et al. [26] defined it as the degree to which one believes in their counterpart's ability to effectively perform the assigned tasks and achieve the goals. Lewis and Weigert [27] described cognitive trust as entirely trusting a counterpart for rational reasons. This concept of cognitive trust has been researched in various fields such as sociology, economics, and psychology, and has been mainly explored in fields where trust is considered to be a logical choice [28]. The perspective of logical choice does not consider sentimental influence, because it is driven by the degree of mental inference or judgment. In other words, cognitive trust implies trusting with a high level of rationality based on the abilities or expertise of a counterpart. Dowell et al. [29] argued that in interfirm relationships, cognitive trust based on factors such as abilities and expertise is more critical than emotion-based affective trust.

Cognitive trust is highly significant within the supply chain context. Jiang et al. [30] argued that trust within the supply chain enables smooth collaboration with transaction partners. Additionally, Handfield and Bechtel [31] emphasized that cognitive trust enhances the agility of the supply chain.

In summary, cognitive trust refers to the extent to which one believes in their counterpart based on their expertise and objective indicators and is deemed essential for maintaining mutual relationships. Therefore, cognitive trust is necessary for activities occurring within relationships among companies within the supply chain.

2.1.2. Affective Trust

Affective trust refers to trust based on emotions that arise in relationships with others [22]. Lewis and Weigert [27] described consideration for others as affective trust, highlighting subjective features such as emotional and psychological states in the relationship with others [32]. These characteristics differ from cognitive trust, which is formed based on objective indicators when trusting others.

Affective trust also plays a significant role within the supply chain. It helps reduce uncertainty about the other party and fosters positive emotions [33]. Ha et al. [26] asserted that affective trust is crucial for information sharing and effective collaboration among companies. In a similar context, de Almeida et al. [34] proposed sentimental trust as a factor that may mitigate the bullwhip effect, which is a phenomenon that can occur within the supply chain. Affective trust implies a belief that, even in the absence of monitoring or constraints on the actions of the other party, they will willingly act in the best interest of achieving high performance. In summary, affective trust is deemed crucial for strengthening collaboration within the supply chain and reducing uncertainty.

2.2. Supply Chain Risk Management Collaboration

Supply chain risk management involves achieving collaboration with partners within the supply chain to address risks and uncertainties that arise or impact logistics-related activities and resources. Collaboration among companies within the supply chain is essential to effectively align demand and supply. Therefore, companies make efforts to prevent risks within the supply chain proactively and reactively. These efforts include engaging in transactions with partners, sharing information, setting common goals, making joint decisions, sharing resources, incentives, and risks, and achieving vertical integration, supply chain diversification, and regional sourcing [10,13,35]. However, risks in the supply chain are challenging for individual companies to control, and they can occur unexpectedly, limiting the ability to respond. Despite proactive measures for external risk management, new forms or massive risk factors may emerge. Since it is nearly impossible for companies to prepare for every risk, there is a need to systematically manage risks in a feasible manner without compromising the construction of the supply chain and mutual benefits [7].

Lambert et al. [36] argued that building processes for sharing risks and rewards can lead to higher business performance than what individual companies can achieve on

their own. In a similar context, Prajogo and Olhager [8] emphasized that, for healthy relationships among members within the supply chain, efforts should not only focus on improving a company's performance but also on supporting industry-related risk mitigation. Furthermore, Reshad et al. [9] noted a systematic and stepwise approach among members of the supply chain for the identification, evaluation, mitigation, and control of potential risks in the supply chain, and stated that mutual collaboration was essential. In other words, in the realm of supply chain risk management, collaboration is perceived as a means to swiftly control and respond to risks and mitigate risks through a cooperative attitude with supply chain members.

Simatupang and Sridharan [37] highlighted inherent challenges related to the inertia of supply chain collaboration. To address these issues, they proposed an integrated framework for supply chain collaboration strategies. The overarching goal, referred to as the integrated policy, encompasses the collective identification of strategies and tactical plans by supply chain members. These plans aim to address longstanding policies that require modification and establish methods for managing associated risks. Among various levels of planning, strategic-level planning—led by top management—focuses on collaboratively resolving potential conflicts that may arise in the process of creating a competitive advantage for the company. Jüttner et al. [10] asserted the significance of collaborative efforts in risk sharing among companies within the context of supply chain risk mitigation strategies. They emphasized that shared efforts among partners in addressing risks and losses can more effectively reduce the impact triggered by these risks.

The second overarching goal, appropriate performance measurement, involves establishing a system that fairly measures the benefits and costs of risks. By measuring the relative contributions and performances of each supply chain member, such a system acknowledges the performance and efforts of partners. This recognition, in turn, helps improve and motivate partners' performance. Once an effective performance measurement system is established, incentives can be provided when supply chain members achieve goals through collaboration, or burdens arising from collaboration can be shared. Moreover, consistent provision of incentives and sharing of burdens enhances the interest and efforts of supply chain members.

The third goal involves information sharing, facilitating the exchange of essential information within the supply chain to enhance the understanding of each member's situation. Generally, information sharing yields significant benefits for participating members. At the tactical level, it helps alleviate demand uncertainty for other organizations and cope with decision-making complexity [38]. Furthermore, information sharing proves valuable in addressing relational vulnerabilities associated with opportunistic behaviors, such as adverse selection and ethical risks.

In other words, the supply chain risk management collaboration in this study determines how members must act to reach collaboration goals in situations of supply chain crisis and to achieve success in the supply chain. A well-designed framework for supply chain risk management collaboration is achievable, albeit challenging.

A comprehensive review of supply chain risk management reveals that most of the existing studies have simply measured information sharing. At the same time, it points to the paucity of studies examining a system-wide approach across the supply chain. A noteworthy exception is the study by Li and Chen [39]. Although this study took a system-wide approach, it did not focus on cooperation in risk situations. We briefly review the relevant literature below and provide a detailed summary of these studies in Table 1.

Table 1. Relevant collaboration literature.

Article	Sample Size	Industry Sector	Results	Collaboration Measurement	Supply Chain Risk	Systems Approach
Cao and Zhang [35]	211	Manufacturing	This study shows that supply chain collaboration enhances collaborative advantage, which in turn positively affects firm performance.	Supply chain collaboration -Information sharing		
Chen et al. [40]	203	Manufacturing, Printing, publishing and recorded media	The results show that each area of collaboration effectively reduces its respective supply chain risk, but only the mitigation of process risk and demand risk has a direct effect on supply chain performance.	-Supplier collaboration -Internal collaboration -Customer collaboration	✓	
Duhamel et al. [41]	242	Manufacturing, services	Internal and (mainly upstream) external collaboration are needed to improve risk management performance.	Internal collaboration -purchasing/sourcing, design, manufacturing, inbound logistics, outbound logistics, and reverse logistics External collaboration -suppliers, logistics providers, distributors, final customers and B-to-B customers	✓	
Gani et al. [42]	297	Beverage, wood leather, iron ore, coal, steel	The result found a positive and significant relationship between Collaboration capability and SCRM.	-Achieving collaboration goals -Satisfaction with organizational collaboration performance -Successful partnership -Satisfaction with partner collaboration performance	✓	
Ha et al. [26]	265	Manufacturing, service, information technology, logistics/distribution	The results indicate significant relationships between affective trust and information sharing, as well as between competency-based trust and joint decision-making, while no significant relationships are found between other variables.	-Joint decision making -Information sharing -Benefit/risk sharing		✓ (SCP)
Juan et al. [43]	113	High-tech manufacturing, Traditional manufacturing	The results reveal that SC collaboration is an exogenous driver of SC resilience; it directly affects visibility, velocity, flexibility, robustness and SC performance under disruption.	Supply chain collaboration -Partner collaboration -Communication plan -Process and product design -Operational processes implementation Interaction in case of problems	✓	

Table 1. Cont.

Article	Sample Size	Industry Sector	Results	Collaboration Measurement	Supply Chain Risk	Systems Approach
Kumar et al. [44]	77	Manufacturer, Whole-sale/Distributor, Service, Retailer	The findings and analysis demonstrate that culture and relationship strength significantly and strongly influence each collaborative activity, with relationship strength fully mediating the relationship between collaborative culture and supply chain performance.	Information sharing		✓
Li et al. [45]	350	F and B, alcohol, and Cigar, Textiles and Apparel, Toys, Service, Others	This study finds that risk information sharing and risk sharing mechanisms improve financial performance, with their effectiveness influenced by relationship length, supplier trust, and shared supply chain risk management understanding.	Collaborative relationship -Relationship length -Supplier trust -Shared SCRM understanding	✓	
Li and Chen [39]	264	Manufacturing	Supplier collaboration at operational level enables firms to achieve better performance through improving firms' risk management capabilities toward normal risks, internal processing risks, and extraordinary risks with limited resource investment.	Supplier collaboration -Clear Communication -Shared Understanding -Regular Meetings -Timely Feedback -Providing Training	✓	✓
Mwesiumo et al. [46]	145	oil and gas, fishing, textile and clothing, paper and paper products, rubber and plastic, electronics, machinery and equipment, metal goods, chemicals, and furniture	The results show that collaborative risk identification, perception of supply risks, and overall focus on mitigating disruptive risks have a significant direct effect on collaborative supply risk mitigation.	Collaborative supply risk mitigation -Sharing risks -Creating contingency plans -Improving bottlenecks in the supply chain -Implementing strategically placed safety stocks -Postponing commitment of resources -Ensuring high information flow	✓	
Sengupta et al. [47]	145	Manufacturing, Services	This research compares the effect of traditional manufacturing-oriented supply chain strategies on the operational and financial performance of firms in service and manufacturing sectors, highlighting the need for sector-specific supply chain strategies.	Information sharing -Sharing inventory information -Sharing demand forecasts -Sharing price promotion information -Sharing electronic information		

In this study, drawing on preceding research, collaborative supply chain risk management is conceptualized by covering three key domains: (1) information sharing with collaborating partners regarding mutual demand forecasts and market trends, (2) the extent of sharing profits and costs in business operations with collaborating partners, and (3) the extent of jointly addressing risks and losses in business operations with collaborating partners. By doing so, this study distinguishes itself from previous studies that have focused on only one or two collaboration areas, thereby providing a more comprehensive understanding of collaboration in supply chain risk management.

2.3. Logistics Performance

Logistics is the integrated process that encompasses the entire journey of a product, from the point of production to the final manufacturing of the product, and its delivery to the customer. Specifically, the National Council of Physical Distribution Management (NCPDM) in the United States defines logistics as the planning and control of the entire process, from raw material procurement, to the customer, to meeting customer requirements. Logistics is a crucial factor within the supply chain, and businesses are increasingly recognizing its importance. Keebler and Plank [48] described logistics performance as the evaluation of a company's performance in various logistics-related objectives. Similarly, Chow et al. [49] defined logistics performance as the capability of a company to willingly accept all situations that arise when performing logistics-related tasks, considering it as a subset of organizational and corporate performance.

Meanwhile, the measurement of logistics performance is essential for companies for various reasons. First, the measurement of logistics performance is related to market share and profitability, which may be viewed as the performance of the company. Furthermore, the measurement of logistics performance enables trade-off analysis between logistics costs and customer services [50]. Therefore, it may be considered important to measure the performance of all activities associated with logistics using the right tools.

The interpretation and conceptualization of logistics performance have varied among researchers. Stank et al. [51] classified logistics performance into financial and non-financial categories, whereas Iacovou [52] categorized it as operational and strategic. Operational performance involves reductions in inventory and transaction costs, while strategic performance encompasses improvements in service, increased competitiveness, and enhanced operational efficiency. Furthermore, Harrison and New [53] measured logistics performance using indicators such as lead time, cycle time, order fulfillment rate, and total logistics costs. Furthermore, Khan and Rattanawiboonsom [54] argued that logistics performance must be examined by separating the internal/external aspects, and Kalubanga and Namagembe [55] measured logistics performance by classifying it into performance relative to competition and internal performance.

Considering the diverse presentation of logistics performance by researchers based on their research objectives, it becomes crucial to appropriately select indicators tailored to achieving a specific research purpose. Drawing upon insights from previous studies, this research delves into the assessment of logistics performance using indicators such as total logistics costs, lead time, order fulfillment rate, inventory turnover rate, and logistics quality improvement.

3. Hypothesis Development and Research Model

3.1. Trust and Supply Chain Risk Management

Trust emerges as the most effective means to mitigate costs incurred during transactions and plays a pivotal role in establishing a robust supply chain [20]. While many supply chain collaborations assume a shared enthusiasm for collaboration among partners, achieving this in practice is often challenging. To address these challenges, a novel collaborative approach grounded in trust, authenticity, and reliability is advocated [15]. Foundational trust in sincerity and reliability offers a unique pathway to augment the effectiveness of collaboration.

Some companies—apprehensive about potential risks such as information misuse or leaks—avoid addressing these risks and are reluctant to share information with their counterparts. This reluctance results in increased transaction costs and agency costs for the other party, posing challenges in establishing mutual trust. Moreover, when a trust relationship does not exist with a trading partner, the proportion of manager time and costs tends to be higher. In contrast, partners with a high level of trust are recognized for transparently sharing all relevant information [24]. Consequently, a lack of trust between partners stands out as the most significant cause of failed relationships.

Moreover, within the realm of supply chain management, the literature underscores the pivotal role of trust as a fundamental component when supply chain partners seek to sustain collaboration and foster loyalty to contracts [17]. Tukamuhabwa et al. [56] assert that trust among employees effectively facilitates communication with suppliers and fosters seamless collaboration. Additionally, in the context of supply chain relationships between suppliers and buyers, adopting a cooperative approach enhances the ability to respond to uncertainties such as unexpected demand fluctuations and supply chain disruptions [57]. In essence, trust can be affirmed as a prerequisite for establishing a cooperative supplier–buyer relationship [20]. Furthermore, a previous study suggests that inter-organizational trust serves as a precursor to inter-organizational collaborative behavior [58].

In summary, cognitive trust based on the partner’s abilities and expertise, along with affective trust based on emotions, are essential factors for achieving common goals with transaction partners. Therefore, fostering trust in a partner by being honest and sincere can enhance collaboration in supply chain risk management. Thus, this study formulated the following hypotheses:

Hypothesis 1. *Cognitive trust is positively associated with supply chain risk management collaboration.*

Hypothesis 2. *Affective trust is positively associated with supply chain risk management collaboration.*

3.2. Supply Chain Risk Management Collaboration and Logistics Performance

Collaboration enables a swift response to risks arising from supply chain disruptions and can enhance logistics performance by reducing dissatisfaction through advance planning, shortening lead times, and improving quality. In connection with this, previous research has suggested that transparently sharing not only the benefits and costs but also the mutual risks and losses with trading partners may improve logistics performance [37]. Moreover, several previous studies have suggested that firm performance can be improved by sharing resources through ongoing partnership relationships with trading partners, even in the presence of risks within the supply chain [59,60].

In addition, numerous studies have examined the relationship between supply chain risk management collaboration and logistics performance. Tukamuhabwa et al. [56] explored the relationship between supply chain risk management capabilities and logistics performance. They found that the development of supply chain management capabilities plays a crucial role in fostering collaborative relationships with suppliers, consequently enhancing logistics performance. This aligns with previous research indicating that logistics capabilities related to demand management and information management effectively address market volatility, supply chain uncertainty, and risks [61].

Furthermore, Wieland and Wallenburg [62] stipulated that relationship capabilities such as communication and collaboration are crucial for building resilience and recovery in the supply chain. They highlighted that effective interaction (enhanced connectivity) between entities shortens the new product development cycle and order fulfillment lead times. Finally, scholars have argued that risk-sharing mechanisms can mitigate supply chain risk and align incentives and obligations among members within the supply chain [10].

The existing studies demonstrate that collaborative supply chain risk management is a crucial factor for enhancing logistics performance. Even when risk factors arise in various parts of the supply chain, member companies can improve logistics performance

by transparently sharing information, such as market trends, operational risks/losses, and profits/costs, and strengthening mutual cooperation.

Therefore, this study proposes the following hypothesis:

Hypothesis 3. Supply chain risk management collaboration is positively associated with logistics performance.

Figure 2 shows the hypotheses and research model of this study.

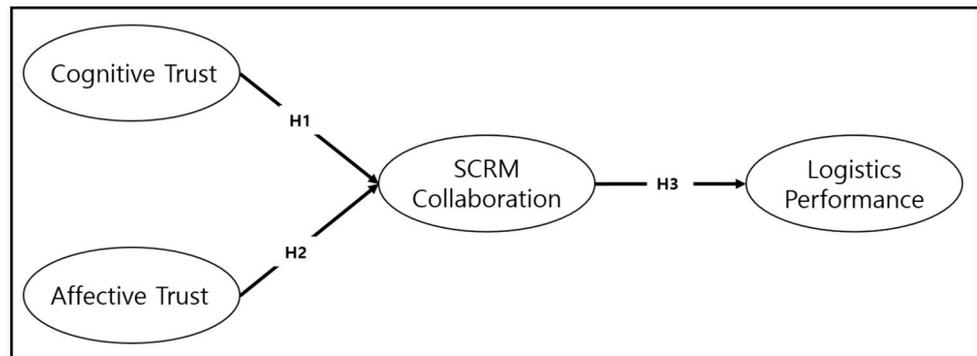


Figure 2. Research model.

4. Research Method

4.1. Measurement

The latent variables in this study were measured using 16 items that have been validated in previous studies. Specifically, cognitive trust was measured using four items, affective trust using three items, supply chain risk management collaboration using three items, and logistics performance using six items. Each item used a 7-point Likert scale, where 1 indicated “very poor,” 4 indicated “neutral,” and 7 indicated “very good.” Table 2 presents the measurement items along with relevant references.

Table 2. Measurement items.

Latent Variable	Items	Reference(s)
Cognitive trust	The degree of trust in each other’s job performance capabilities. The satisfaction level with each other’s knowledge and expertise. The degree to which each other’s opinions on knowledge and experience are embraced or accepted The extent to which each party perceives the other as having distinctive knowledge/expertise or capabilities	Ayari and Boulila [63], Moberg and Spech [64]
Affective trust	The degree of diligence and honesty in approaching tasks The extent to which each party respects and embraces each other’s perspectives and arguments. The degree to which there is a positive mutual perception.	
Supply Chain Risk Management Collaboration	The extent of sharing information on demand forecasting and market trends. The extent to which profits and costs in business operations are shared. The extent to which parties collaboratively address and manage risks and losses between each other.	Juttner [65], Morris and Carter [66]
Logistics performance	Logistics-related costs such as transportation, storage, and inventory management. Annual inventory turnover rate.	Kannan and Tan [67]
	The ability to deliver ordered goods according to specified conditions to a designated location within a given timeframe. The time associated with the production and delivery of ordered goods.	Harrison and New [53]
	The satisfaction level regarding logistics quality. The ability to respond flexibly to changes in orders.	Shin et al. [68], Gunasekaran et al. [69]

4.2. Data Collection

This study collected data through a survey conducted with professionals working in supply chain-related departments of manufacturing companies in Korea to examine the effect of trust on supply chain risk management collaboration and logistics performance. A pre-test was conducted over two months, targeting professionals working in relevant departments and involving three professors to validate the content of the questionnaires.

Thereafter, final survey questions were selected, and a total of 2126 questionnaires were distributed through a survey agency (Entrust Survey). Among these, a total of 281 questionnaires were retrieved—excluding respondents who had not met survey conditions, given up midway, or not responded—and were used for statistical analysis. The proportion of valid retrievals was low at 13.2%, probably for two reasons. First, the survey in this study was conducted spanning a total of 10 industry groups based on export and import trend data from the Ministry of Trade, Industry and Energy of the Republic of Korea, and the survey was conducted only with workers in office jobs associated with supply chains, imposing a limit to raising the retrieval rate. There were 53.7% male and 46.3% female respondents. Regarding age groups, the distribution was as follows: 20 s (7.8%), 30 s (35.9%), 40 s (29.5%), and 50 s and above (26.7%), with the 30 s being the most represented age group.

In terms of respondents' positions, the position of team leader or manager was the most prevalent, accounting for 29.2%. Regarding the frequency based on the supply chain position of the company, it was observed that second-tier or indirect suppliers constituted 16.8%, first-tier suppliers accounted for 24.2%, and the original equipment manufacturer (OEM) or principal company represented 25.9%. This could be interpreted as indicating that individuals in their 30 s with a certain level of position and expertise, such as managers, play a crucial role in effectively addressing risks in the supply chain and enhancing logistics performance. Table 3 lists detailed information about the respondents of this study.

Table 3. Demographic information of the participants.

	Variables	Frequency	Rate (%)	
Gender	Male	151	53.7	
	Female	130	46.3	
	Total	281	100	
Age Group	Male	20 s	12	4.3
		30 s	54	19.2
		40 s	45	16.0
		50 s and above	40	14.2
	Female	20 s	10	3.6
		30 s	47	16.7
		40 s	38	13.5
		50 s and above	35	12.5
		Total	281	100
Rank	Male	Staff	20	7.1
		Assistant Manager	42	14.9
		Manager	51	18.1
		Senior Manager	38	13.5
	Female	Staff	57	20.3
		Assistant Manager	28	10.0
		Manager	31	11.1
		Senior Manager	14	5.0
		Total	281	100
Position in the Supply Chain	Tier 2 suppliers and above	47	16.7	
	Tier 1 suppliers	68	24.2	
	Principal company	73	26.0	
	Others	93	33.1	
	Total	281	100	

4.3. Reliability and Validity Tests

Prior to testing the hypotheses of this study, the reliability and validity of the measurement variables were examined. To assess reliability, Cronbach's alpha values were calculated, where a value of 0.7 or higher is generally considered reliable in the social sciences [70]. The reliability analysis yielded Cronbach's alpha values of 0.840 for cognitive trust, 0.775 for affective trust, 0.844 for supply chain risk management collaboration, and 0.896 for logistics performance, indicating satisfactory reliability of the measurement tools.

Subsequently, confirmatory factor analysis was conducted to validate the measurement model, and the fit indices of the model were assessed. Overall, the fit indices generally met the recommended standards (GFI = 0.897, RMR = 0.056, AGFI = 0.848, TLI = 0.943, CMIN/DF = 1.849) [70].

The average variance extracted (AVE) and construct reliability (CR) were calculated to assess the convergent validity of the variables. The AVE for all variables was above 0.5, and CR exceeded 0.7, indicating satisfactory convergent validity. Additionally, all path coefficients were statistically significant at the $p < 0.001$ level, confirming the convergent validity. The results of the confirmatory factor analysis are presented in Table 4.

Table 4. Results of the confirmatory factor analysis.

Path	Unstandardized Coefficient	Standardized Coefficient	S.E.	C.R.	AVE	CR
CT4 (Cognitive trust)	1	0.675				
CT3 (Cognitive trust)	1.196	0.809	0.102	11.761 ***	0.608	0.860
CT2 (Cognitive trust)	1.193	0.826	0.1	11.937 ***		
CT1 (Cognitive trust)	1.029	0.734	0.095	10.858 ***		
AT4 (Affective trust)	1	0.679	□			
AT2 (Affective trust)	1.171	0.829	0.113	10.383 ***	0.562	0.793
AT1 (Affective trust)	1.065	0.701	0.11	9.671 ***		
SC7 (SCRM)	1	0.764				
SC6 (SCRM)	0.971	0.748	0.065	14.87 ***	0.545	0.783
SC4 (SCRM)	0.904	0.795	0.055	16.435 ***		
LP6 (Logistics performance)	1	0.709				
LP5 (Logistics performance)	1.056	0.751	0.075	14.135 ***	0.586	0.894
LP4 (Logistics performance)	1.07	0.694	0.099	10.807 ***		
LP3 (Logistics performance)	1.222	0.864	0.092	13.245 ***		
LP2 (Logistics performance)	1.165	0.804	0.094	12.454 ***		
LP1 (Logistics performance)	1.043	0.717	0.093	11.162 ***		

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Discriminant validity was assessed by comparing the AVE values for each variable with the squared correlations between variables. Discriminant validity is considered confirmed when the squared correlations between variables are not greater than the AVE values. As shown in Table 5, discriminant validity has been confirmed.

Table 5. Results of discriminant validity analysis.

	Cognitive Trust	Affective Trust	Supply Chain Risk Management Collaboration	Logistics Performance
Cognitive trust	0.608			
Affective trust	0.364	0.562		
Supply Chain Risk Management Collaboration	0.198	0.352	0.545	
Logistics performance	0.179	0.299	0.418	0.586

The values below the diagonal represent the squared correlation coefficients.

4.4. Hypotheses Test

To verify the hypotheses of this study, a structural equation model was analyzed. First, the goodness-of-fit indices for the structural equation model were as follows: GFI = 0.894, RMR = 0.091, AGFI = 0.855, TLI = 0.918, and CFI = 0.932. These indices generally met the criteria suggested by Hair et al. [70]. Through the analysis of the structural equation model and path analysis, each hypothesis was tested, and the results are presented in Table 6.

Table 6. Results of hypotheses tests.

Path	Estimate	S.E.	C.R.	<i>p</i>	Result
H1	0.561	0.11	5.12	***	accepted
H2	0.123	0.09	1.242	0.214	rejected
H3	0.612	0.07	8.17	***	accepted

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The analysis results confirm that cognitive trust acts as an antecedent factor for supply chain risk management collaboration, supporting Hypothesis 1. However, the effect of affective trust on supply chain risk management collaboration was found to be statistically insignificant, leading to the rejection of Hypothesis 2. Finally, supply chain risk management collaboration was observed to have a positive effect on logistics performance, supporting Hypothesis 3.

5. Conclusions

5.1. Study Results

In uncertain business environments, where supply chains are prone to disruptions, companies strive to build effective supply chains through supply chain risk management collaboration. Against this backdrop, this study empirically analyzes the effects of two dimensions of trust and supply chain risk management collaboration on logistics performance in inter-firm relationships within the supply chain. The results of the testing the hypotheses of this study are as follows:

First, cognitive trust was found to have a significant positive effect on supply chain risk management collaboration. This implies that companies can effectively achieve their goals by building mutual trust in uncertain business environments. This aligns with the findings of previous research that examined the importance of trust in relationships between companies within the supply chain. For instance, as argued by Tukamuhabwa et al. [56], mutual trust is essential for effective collaboration.

Once a trust relationship is established with a trading partner, there is a commitment to act in the best interest of each other [71]. This means that cognitive trust—defined by factors such as the partner's expertise and capabilities—enables effective information sharing among companies and is a crucial factor in dealing with the complexities of supply chain operations.

Therefore, the findings of this study confirm that cognitive trust is an essential element for supply chain risk management collaboration.

Second, the results showed that affective trust did not have a statistically significant effect on supply chain risk management collaboration. This result differs from previous studies examining this relationship [24,26]. This may be explained in the context of the business culture of the manufacturing industry in Korea. Korea values ability and performance rather than the process. In this respect, it may be explained that when risk arises in the supply chain, cognitive trust based on ability is valued over trust based on emotion, and appropriate actions are taken. Dyer and Chu [72] performed an empirical analysis regarding automotive manufacturers in the United States, Japan, and Korea, where Korean manufacturers noted that a high level of ability and technical capacity were needed to secure the trust of customers. When evaluating a trade counterpart, Korean manufacturers consider quality, ability, and objective processes to be important, which may also be applicable to supply chain members. The findings of this study indicate that affective trust based on emotions towards the trading partner alone may not be sufficient to enhance collaboration in supply chain risk management. Therefore, cognitive trust based on the partner's expertise and capabilities might play a more crucial role than affective trust based on emotions towards the partner to effectively restructure a disruptive supply chain.

Finally, supply chain risk management collaboration was found to have a significant positive effect on logistics performance. Simatupang and Sridharan [37] suggested that companies that transparently share the risks occurring with trading partners and within the supply chain can achieve relatively higher logistics performance compared to those that do not. They also emphasized the need to transparently share information and resources to maintain ongoing partnerships with trading partners.

This implies that for companies to secure a competitive advantage, they must operate efficiently, and to achieve this, companies need to establish relationships that involve sharing both mutual benefits and losses. Previous studies have emphasized that capabilities such as effective exchange, communication, and collaboration with trading partners are prerequisites for achieving lead time reduction, cost savings, and similar benefits [62,65].

Therefore, if companies within the supply chain actively engage in supply chain risk management cooperation, they can potentially enhance logistics performance by achieving cost savings, increased turnover, and reduced lead times.

5.2. Implications and Limitations

The results of this study have several practical and theoretical implications. First, this study examined the effect of mutual trust among companies within the supply chain on supply chain risk management collaboration and the subsequent effect of supply chain risk management collaboration on logistics performance. In the current competitive business environment, companies are not only competing individually but are also engaged in mutual competition through the establishment of supply chains. To secure a competitive advantage within the supply chain, companies need to foster collaborative relationships, and the formation of such relationships relies on the establishment of mutual trust.

As mentioned earlier, previous studies [56] have asserted that trust plays a crucial role in fostering collaboration among companies. Hobbs [57] also suggested that in collaborative relationships with trading partners, trust is essential for effectively addressing uncertain situations. Moreover, studies argue that collaboration in supply chain risk management among companies can lead to improvements in logistics performance, including reduced lead times and enhanced quality [37]. The findings of this study support the arguments of the previous studies mentioned above. Consequently, the importance of mutual trust, particularly cognitive trust, has been validated as a fundamental requirement for enhancing logistics performance through supply chain risk management collaboration among companies within the supply chain.

Second, this study holds theoretical significance by investigating supply chain risk management collaboration within the framework of a comprehensive risk management

system, encompassing information, profit, and cost sharing, as well as coping with risks and losses. In the field of supply chain risk management, traditional risk management strategies have often lacked comprehensive responses to various external risk factors or have been considered only as part of the supply chain risk management process. Unlike previous research, this study stands out, as it comprehensively considers supply chain risk management collaboration from the perspectives of organizational information, risks, and losses, as well as profits and costs.

Third, this study investigates the effect of affective trust among companies within the supply chain on supply chain risk management collaboration. Trust involves shared beliefs that facilitate proactive collaboration and extensive information sharing. However, it was found that affective trust does not significantly influence supply chain risk management collaboration. This implies that, in situations where risks emerge among companies within the supply chain, cognitive trust based on the partner's expertise and capabilities might play a more crucial role in fostering effective collaboration.

In other words, in situations of supply chain risks, it may not be sufficient to rely solely on emotional aspects—such as affective trust based on emotions towards the partner—to promote mutual collaboration. Instead, cognitive trust based on the partner's expertise and capabilities becomes more crucial.

Fourth, this study empirically analyzes the relationships between trust, supply chain risk management collaboration, and logistics performance in the current uncertain business environment. The results indicate that cognitive trust can prevent negative outcomes in situations of risk, such as supply chain disruptions or collapses, and can directly assist in formulating effective risk management strategies for the future.

This implies that in an uncertain business environment, companies need to make internal efforts to build trust relationships with their trading partners. Trust enables information sharing and facilitates the maintenance and smooth promotion of collaboration [24]. Therefore, to strengthen supply chain risk management collaboration, organizations should internalize beliefs or behavioral patterns of trust at the organizational level.

Furthermore, managers should strive to demonstrate their expertise to trading partners to establish cognitive trust. This can be accomplished by obtaining certifications, crafting equitable contracts, supporting the enhancement of employee competencies, and securing professional talents. Through these initiatives, businesses can foster trust relationships with their trading partners, promoting information sharing, minimizing uncertainty, and ensuring stability during supply chain crises.

Finally, this study has practical implications for manufacturing companies in Korea. The results of this study, unlike previous empirical analyses of the relationship between emotional trust and information sharing in supply chain collaboration, do not support the effect of affective trust on supply chain risk management collaboration. This suggests that, to promote supply chain risk management collaboration, it is not sufficient to rely solely on affective trust factors such as openness, honesty, and sincerity between companies. Instead, building objective capabilities and establishing cognitive trust are crucial for effective collaboration.

However, although affective trust did not show significance in the results of this study, affective trust remains crucial for addressing power imbalances in the supply chain. Power imbalances and unequal distribution of authority can make it difficult to establish trust-based partnerships. Addressing such power imbalances can be facilitated through affective trust. Therefore, manufacturing companies in Korea should identify factors hindering affective trust and make efforts to improve them.

Nevertheless, this study has several limitations. First, the sample used was confined to the manufacturing sector in South Korea. Although South Korea is globally renowned in the manufacturing industry, it has made strides in emerging fields such as biotechnology, healthcare, and artificial intelligence. Given the diversity of industries within South Korea, future research could expand its scope to encompass various industrial sectors. Examining the relationship among trust, supply chain risk management collaboration,

and logistics performance across different industries could yield more meaningful and comprehensive results.

Second, this study treated cognitive trust and affective trust at the same level. However, it is plausible that affective trust may serve as a precursor to cognitive trust. Exploring this relationship in future research could provide a clearer understanding of the role of trust within the supply chain. By considering affective trust as a potential antecedent to cognitive trust, future research could shed light on the dynamics of trust within the supply chain in various business contexts.

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