



# An Empirical Study on the Effect of Trust between Firms in the Supply Chain on Agility and Logistics Performance

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## Abstract

**Purpose:** This study explores the effect on supply chain agility and logistics performance of building mutual trust between manufacturing companies that have adopted supply chain management. Previous studies has categorized trust into affective and cognitive types, and speed, flexibility, and responsiveness are recognized as subfactors of supply chain agility. **Methodology:** A survey gathered responses from employees of domestic manufacturing firms with supply chain management implementations. 254 valid responses underwent statistical analysis using structural equation modeling (SPSS 23.0 and AMOS 23.0). **Results:** Affective trust positively influences speed and responsiveness but not flexibility. Cognitive trust positively affects speed, flexibility, and responsiveness. Supply chain agility positively impacts logistics performance. However, neither affective nor cognitive trust significantly influences logistics performance. **Conclusions:** The study suggests that cognitive trust based on capabilities is more important than affective trust for flexibility in corporate relationships, a subfactor of supply chain agility. However, trust alone cannot enhance corporate performance. This research is significant as it examines the roles of trust and agility in the context of the COVID-19 pandemic, which has exacerbated the manufacturing business environment.

**Keywords:** Trust, Supply Chain Agility, Logistics Performance, Supply Chain Management

**JEL Classification Code:** C83, M10, M11, L60

## 1. Introduction<sup>2</sup>

Markets and business environments today are rapidly changing. Specifically, markets are becoming increasingly complex, and product life cycles are getting shorter. Further, with increased uncertainty in demand, companies must be prepared to respond to it quickly and flexibly. To this end, companies must build an efficient supply chain, rather than competing individually. In other words, the recent business environment of persistent uncertainty is due to competition within the supply chain (Mentzer et al., 2001).

In supply chain management, the following three considerations are essential for corporate performance: First, we must approach supply chain management with a perspective that includes the entire supply chain; second, through consistent cooperative relationships with partners in the supply chain, a strategic approach should be developed to consider the direction that each one wants to achieve; and finally, our approach must provide new value to end consumers (Min & Mentzer, 2004). A company that builds an efficient supply chain can satisfy customers through reduced lead time and timely delivery, which can improve

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its competitiveness in the market. Nevertheless, many manufacturing companies have difficulties in establishing supply chains because of lack of technology, organizational capacity, and capital.

Specifically, although there is awareness regarding the importance of trust and agility between companies in the supply chain, supply chains have collapsed recently because of the COVID-19 pandemic, so many companies are keenly feeling the need for supply chain crisis management. Furthermore, the COVID-19 quarantine policy resulted in uncertainty in the supply and demand of raw materials due to production disruptions as well as uncertainty in demand forecasting due to the enormous increase in demand for some product groups, increasing companies' difficulty in managing their supply chains (Alicke et al., 2021; Hohenstein, 2022). Thus, companies have been hit hard throughout manufacturing industries' supply chains because of disruptions in supply volume, reduced supply, and uncertainty in demand forecasting, resulting in a huge negative effect on the national economy.

Ali et al. (2021) have argued, "In the COVID-19 era, building trust and collaboration throughout the global semiconductor supply chain is essential for the manufacturing industry to get back on track." Furthermore, Yeo Seung-bae, Assistant Minister of Foreign Affairs of South Korea, noted, "As the world is facing an era of great transformation, key items and technologies such as semiconductors and raw materials must move away from the market logic based on efficiency, and their supply chain structure must transform to become safer and more reliable, even if the cost is slightly higher." Therefore, mutual trust in the relationships between companies in the supply chain, including manufacturing, is crucial.

Furthermore, supply chain agility is attracting attention as a means to cope with today's uncertain, rapidly changing business environment, and it is an essential element for global competitiveness (Gligor & Holcomb, 2012). Specifically, companies must quickly detect uncertainties and risks and perform supply chain activities with agility and flexibility (Do et al., 2021). Fayezi and O'Loughlin (2017) have also emphasized the need for companies to secure agility to respond to changing environments.

Therefore, this study examines the effect of trust between companies in the supply chain on agility and logistics performance in an uncertain business environment. Specifically, in this study, trust was classified as affective and cognitive trust and supply chain agility was divided into speed, flexibility, and responsiveness. Furthermore, how the relationships between these factors affect the logistics performance of manufacturing companies in Korea was studied. Therefore, this study's objectives are as follows:

1) Understanding the effect of trust on supply chain agility and logistics performance;

2) Understanding the importance and necessity of trust in manufacturing companies in South Korea; and

3) Exploring the effect of agile behavior on corporate performance in an uncertain environment.

## 2. Theoretical Background

### 2.1. Trust

Trust refers to the voluntary willingness of a company to rely on a counterparty based on its belief in the behavioral intentions and capabilities of the other party (Moorman et al., 1992). Scholars have defined trust as the expectation or prediction of a company for the future behaviors of a counterparty (Cai et al., 2010). Further, trust is the intention to trust and rely on the other person in interpersonal relationships, and it is also explained as suppressing another person's behavior that goes beyond expectations (Liang et al., 2018). In other words, trust can be seen as the level of belief that the other party will act as expected (Allen et al., 2018). If mutual trust between two companies is established, the company can avoid risks that may arise from several types of investment and minimize opportunistic behavior by counterparties (Mayer et al., 1995). Further, Ballou et al. (2000) have found that trust is necessary for smooth cooperation between companies within the supply chain, and it is especially important in the early stages of cooperation.

Trust can be interpreted at various levels. For example, Doney and Cannon (1997) noted that trust is not only related to openness, honesty, and know-how with partners but also a key factor in supply chain management. Wilson and Vlosky (1998) emphasized the importance of trust in creating productive partnerships with other parties. Trust is, thus, defined by researchers according to the purpose of their research. Cook and Wall (1980) classified trust as the institutional trust formed by the organization or CEO, vertical trust formed by superiors and subordinates, and horizontal trust formed by colleagues. Lewis and Weigert (2012) divided trust into two dimensions from the perspective of social psychology, affective and cognitive trust, which are covered in the present study.

#### 2.1.1. Affective trust

Affective trust refers to trusting and relying on another person emotionally or affectively. Specifically, based on the degree of interest expressed by the other person, it can be said to be the degree of trust a person has in the other person (Johnson & Grayson, 2005). Therefore, it can also be interpreted as kindness and goodwill shown to the counterparty before the desire to take advantage of them (Mayer et al., 1995). Lewis and Weigert (2012) described

affective trust as a belief based on emotional bonds formed in social interactions, and Doney and Cannon (1997) described it as a psychological state formed between individuals. Affective trust starts with attention and consideration for the other person and can also occur in situations where rationality is lacking (Rempel et al., 1985).

Thus, affective trust refers to the belief that the counterparty will be willing to act favorably with their partner for high performance, even if there is no monitoring or policy constraints on behavior from others (Doney & Cannon, 1997). This behavior is possible when a relationship is based on the tendency to help one other, and the closer the relationship with the counterparty, the stronger the trust behavior (Nyaga et al., 2010). Affective trust also plays a key role in the supply chain. This is because affective trust can reduce uncertainty regarding partners and is crucial in forming positive emotions (Lawler, 2001). Affective trust is also a factor that can reduce the bullwhip effect, a phenomenon that occurs in the supply chain (De Almeida et al., 2017).

### 2.1.2. Cognitive trust

Cognitive trust is formed based on the ability of the other party, where ability refers to the capabilities and skills of the supplier that affect the buyer–supplier relationship (Mayer et al., 1995). Specifically, Lewis and Weigert (2012) noted that cognitive trust is built on the predictability of behavior through rational knowledge based on the other person's potential, expertise, and consistency. Therefore, cognitive trust can be said to be objective trust, with a high level of rationality based on the other person's expertise or ability rather than emotion.

Cognitive trust also plays a crucial role in the supply chain. Handfield and Bechtel (2002) found that cognitive trust is necessary as an antecedent factor of supply chain agility. Further, Dowell et al. (2015) argued that cognitive trust is more significant than affective trust in the relationship between companies. Therefore, cognitive trust can be considered a key factor in the relationship between companies in the supply chain.

## 2.2. Supply Chain Agility

The concept of agility was steadily researched in the field of social science in the 1950s. In the 1990s, agility emerged in response to a dynamically changing environment. From the viewpoint of manufacturing strategy, most researchers have regarded agility as a system (Flexible Manufacturing System: FMS) that enables multi-kind, small-quantity production in the field of production management. Further, several previous studies have revealed that agility is the capability necessary for

companies to survive in an uncertain, volatile market environment (Agarwal et al., 2007; Braunscheidel & Suresh, 2009).

This capability of agility has been defined in various disciplines and fields. Looking at agility in terms of manufacturing, Gunasekaran (1999) defined it as the ability to develop products and services in an unpredictable environment by responding quickly and effectively in a changing market. Christopher (2000) described agility as the ability of a company to swiftly respond to the changes and demands of various customers, enabling integrated business operations through visibility on demand forecasting, quick response, and flexible action (Aitken et al., 2002). Therefore, many companies are striving to build agility capabilities to survive in an unpredictable environment by responding efficiently and effectively in an unpredictable environment.

Supply chain agility focuses on the ability of the entire supply chain to respond to a changing environment (Gligor et al., 2019). Agility is essential for companies and must be used throughout the supply chain to create sustainable value (Fayezi et al., 2015). Specifically, Christopher (2000) described supply chain agility as the ability of an organization to respond quickly to changes in demand in terms of variety and volume. Gligor et al. (2019) noted that supply chain agility is a company's ability to change its supply chain tactics and operations at a rapid pace, and Christopher and Peck (2004) described it as the ability to quickly respond to unpredictable changes in demand or supply. Further, Swafford et al. (2006) defined supply chain agility as a company's ability to quickly adapt and respond to uncertain market conditions and mentioned speed as a specific factor.

Supply chain agility has been extensively studied as a multidimensional construct, and Ngai et al. (2011) suggested responsiveness, flexibility, and speed as key elements of agility in uncertain situations. Lin et al. (2006) presented responsiveness, capacity, speed, and flexibility as key dimensions. Finally, Braunscheidel and Suresh (2009) described supply chain agility as a company's ability to respond quickly to changes in the market when internal, external, or key suppliers are disrupted.

In this context, speed/swiftness/quickness refer to a company's ability to complete tasks as quickly as possible in terms of business processing time and period, which involves minimizing operating time. Sharifi and Zhang (2001) have argued that speed is necessary for organizations to operate agilely. Flexibility refers to constantly launching various new products, as well as quickly changing existing products and responding to customer needs (Fatemi, 2010). Specifically, flexibility is crucial in supply chains for building continuous and long-term relationships rather than short-term transactional relationships and can be seen as the ability to respond to new and changed requirements

(Agarwal et al., 2007). Similarly, Beamon (1999) argued that even if the degree of external change is high and uncertain situations occur, a company has high flexibility if it recognizes and accepts it in terms of management. Therefore, to reduce uncertainty and avoid risk in the supply chain, supply chain flexibility must be enhanced. Increasing their level of flexibility can give companies a competitive edge by reducing costs, improving quality and services, and shortening delivery time (Zhang et al., 2002). Finally, responsibility refers to the ability of a company to recover to a stable state after promptly recognizing internal and external changes in the business environment. As change here refers to a sudden event that could not be predicted by a company or something that has already happened, responsiveness is the ability to cope with unexpected situations (Sharifi & Zhang, 2001). Responsiveness is also crucial for companies in the supply chain because of its attributes like prompt action, detection, prediction, and restoration capabilities for environmental changes (Helo, 2004). For example, if a company's level of responsiveness increases, it can improve its meeting of customer needs and the flexibility of its production systems. To increase responsiveness, companies must be able to quickly recognize market demand and respond effectively to changes.

### 2.3. Logistics performance

Logistics is a key component of the supply chain, in terms of managing the routes from raw materials to the end buyer (Stank et al., 2005). The integration of all logistics processes of companies in the supply chain is pertinent. Specifically, the Logistics Management Association of the United States defines logistics as planning, managing, and supervising the entire process from purchasing raw materials to accept customer requirements. For this reason, it is impossible for a single company to achieve its goal in logistics; rather, it can be achieved through cooperation between companies participating in the supply chain.

Logistics performance is measured using various indicators. Stank et al. (2005) divided logistics performance into factors related to time (e.g., delivery completion time, delivery time, cycle time); cost (e.g., logistics cost, purchasing cost, sales cost); and corporate efficiency (e.g., inventory turnover, order completion rate, logistics flexibility increase). Fugate et al. (2010) divided logistics performance into operational and strategic performance. For operational performance, reduction in transaction cost, reduction in inventory, and speed of information processing were studied. For strategic performance, improvement in customer service, increase in competitiveness, and increase in operational efficiency were studied. Additionally, in a previous study by Harrison and New (2002), lead time, cycle time, order completion rate, and total logistics cost were

used as measurement indicators for logistics performance.

## 3. Derivation of Hypotheses and Research Model

Based on previous research, this study presents how trust between companies in the supply chain impacts agility and logistics performance.

### 3.1. Trust and Supply Chain Agility

Trust is interpreted slightly differently between academic fields of study. In sociology and psychology, trust is interpreted as belief or behavior expected from another party (Achrol, 1991), and in business administration, it is interpreted as belief in another party (Tejpal et al., 2013). Trust is a fundamental factor in the supply chain because it aids in resolving mutual problems when they arise. Further, Doney and Cannon (1997) found that affective trust between two partners allows them to reject opportunistic behavior and buyers can change flexibly when faced with unexpected situations.

The correlation between trust and supply chain agility has been explored from various perspectives. Zur et al. (2012) suggested the importance of trust in the exchange relationship between a buyer and a seller and argued that a mutually amicable relationship can be formed if the partners respond well to contingency situations. Further, they noted that the buyer's degree of flexibility differs according to their levels of affective and cognitive trust and that flexibility will increase if a seller has confidence in the buyer's trust, sacrifice, and competence. Handfield and Bechtel (2002) found that trust can enable communication and create a strategic vision. Further, they explained that as mutual trust is confirmed, informal contracts between the parties to a transaction can be maintained, and formal contracts can be concluded more flexibly and quickly.

Therefore, from the perspective of the relational nature of supply chain management, trust plays a vital role in business relationships. Further, trust between companies must be established so that they can respond quickly and flexibly to unexpected situations, reduce enormous costs, and gain a competitive edge. Based on the above, this study established the following hypotheses.

Hypotheses 1. Affective trust has a positive effect on supply chain agility.

Hypotheses 1-1. Affective trust has a positive effect on speed.

Hypotheses 1-2. Affective trust has a positive effect on flexibility.

Hypotheses 1-3. Affective trust has a positive effect on responsiveness.

Hypotheses 2. Cognitive trust has a positive effect on

supply chain agility.

Hypotheses 2-1. Cognitive trust has a positive effect on speed.

Hypotheses 2-2. Cognitive trust has a positive effect on flexibility.

Hypotheses 2-3. Cognitive trust has a positive effect on responsiveness.

### 3.2. Supply Chain Agility and Logistics Performance

Supply chain agility is the ability to integrate and reorganize internal or external capabilities to respond quickly and flexibly to an uncertain, rapidly changing environment; it plays a critical role in increasing a company’s competitive edge (Swafford et al., 2006). Further, supply chain agility affects total logistics cost, inventory turnover, lead time, and order completion rate (Agarwal et al., 2007); flexibility, a subfactor of supply chain agility, aids in responding appropriately to an uncertain environment (Agarwal et al., 2007; Sánchez & Pérez, 2005). Vickery et al. (1999) found that flexibility, a subfactor of supply chain agility, has a significant effect on improving corporate performance, and Swafford et al. (2006) noted that flexibility can improve business performance in manufacturing companies. Further, Blome et al. (2013) concluded that supply chain agility in terms of dynamic capabilities plays a mediating role in the relationship between demand and supply and logistics performance. Therefore, in a fast and uncertain business environment, companies must respond quickly and flexibly to reduce costs, reduce lead time, and enhance corporate competitiveness. Additionally, as per previous studies, supply chain agility must have an impact on logistics performance. The following hypotheses were established accordingly.

Hypotheses 3. Supply chain agility has a positive effect on logistics performance.

Hypotheses 3-1. Speed has a positive effect on logistics performance.

Hypotheses 3-2. Flexibility has a positive effect on logistics performance.

Hypotheses 3-3. Responsiveness has a positive effect on logistics performance.

### 3.3. Trust and logistics performance

The concept of trust is often described as belief in the other party (Doney & Cannon, 1997). It has been studied in various fields. Morgan and Hunt (1994) found that trust plays a significant role in having belief and confidence in the counterparty in a continuous, long-term relationship. Further, Kwon and Kwon (2010) have noted that when

mutual trust is formed, uncertainty in transactions can be alleviated, transaction costs can be reduced, and contracts can be established flexibly.

Meanwhile, mutual trust increases transaction efficiency, reduces costs incurred in decision-making, and strengthens belief in actions (Donney & Cannon, 1997). Lack of trust in business-to-business relationships increases the likelihood of counterparties protecting and defending against uncertainty and risk, which in turn leads to deterioration in performance. Trust enhances the strategic flexibility of counterparties to respond quickly to uncertain circumstances in a rapidly changing, dynamic environment. Companies with an elevated level of trust are likely to have high performance in mutual alliances (Paliszkievicz et al., 2015). In other words, trust inevitably affects logistics performance. Therefore, the following hypotheses were established.

Hypotheses 4. Affective trust has a positive effect on logistics performance.

Hypotheses 5. Cognitive trust has a positive effect on logistics performance.

These hypotheses were framed to establish the research model shown in Figure 1, and hypothesis testing was performed.

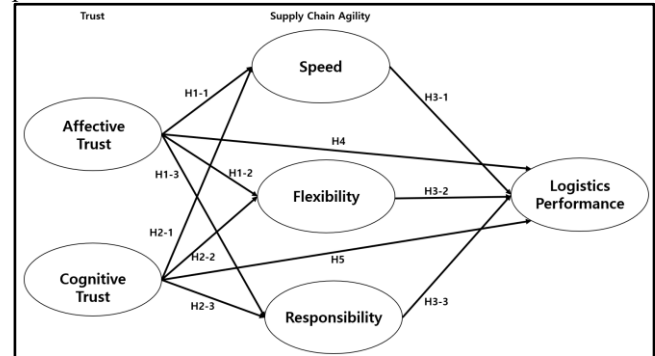


Figure 1: Research Model

## 4. Research Method and Empirical Analysis

### 4.1. Data Collection and Sample Characteristics

This study’s sample comprised manufacturing companies part of the supply chain in Korea. To ensure the validity of the survey contents prior to distributing the questionnaire, from June to July 2020, five faculty members and researchers provided advice related to measurement items. Based on this, the final questionnaire items were selected, and all questionnaire items were measured on a 7-point Likert scale. The survey respondents were selected from among employees working for manufacturing companies involved in the supply chain; 2,126

questionnaires were sent out, of which 300 copies were collected (response recovery rate = 14.1%). Among these, 254 valid responses were finally used for statistical analysis after excluding 46 inappropriate samples (e.g., those in which participants consistently responded with a single number).

Based on the 254 responses included in this study, a statistical hypothesis testing was conducted. First, the main demographic characteristics of the sample were identified. In terms of gender, 139 were male (54.7%) and 115 were female (45.3%). In terms of age, 29 were in their 20s (11.4%), 113 were in their 30s (44.5%), 68 were in their 40s (26.8%), and 44 (17.3%) were in their 50s or older, confirming that those in their 30s numbered the highest in the sample. Next, we investigated respondents' positions, and managers had the highest distribution at 28.0%. Finally, with regard to the respondents' department, the number of people working in the sales/marketing department was the highest at 53 (20.9%), followed by those in the production/quality department at 50 (19.7%).

**Table 1:** Sample characteristics

Category		Frequency	Percentage (%)
Sex	Male	139	54.7
	Female	115	45.3
	Total	254	100.0
Age	20s	29	11.4
	30s	113	44.5
	40s	68	26.8
	50s and above	44	17.3
	Total	254	100.0

Employee	67	26.4
Assistant manager	60	23.6
Manager	71	28.0
Deputy general manager	30	11.8
Higher position	25	9.8
<b>Total</b>	254	100
R&D/Technology	46	18.1
Sales/Marketing	53	20.9
Production/Quality	50	19.7
IT/Technical assistance	39	15.4
Logistics/Distribution	45	17.7
Others	21	8.3
<b>Total</b>	254	100

## 4.2. Definition and Measurement of Variables

Affective and cognitive trust were used as independent variables in this study to measure the items used in previous studies by Ha et al. (2011) and Moberg and Spech (2003) on supply chains after appropriate modification. Next, the measurement items used by Gligor et al. (2019) and Swafford et al. (2006) were used for speed, flexibility, and responsiveness as subfactors of supply chain agility, and speed was measured with three items, flexibility with five items, and responsiveness with three items. Finally, the outcome variable of logistics performance was measured to evaluate six items based on the measurement items used in the empirical studies of Harrison and New (2002) and Kannan and Tan (2004). Operational definitions of the above measurement items are shown in Table 2

**Table 2:** Operational definitions of variables

Variable	Measurement variable	Operational definition	Reference(s)
Affective Trust	Integrity	The degree to which a person is sincere and honest in their work	Ha et al. (2011); Moberg and Spech, (2003)
	Mutual respect	The degree to which one another's positions and opinions are respected and accepted	
	Mutually positive interpretation	The degree to which parties interpret each other positively	
Cognitive Trust	Mutual trust in job performance	Degree of trust in one another's ability to perform duties	
	Mutual know-how/trust in expertise	Degree of satisfaction with one another's know-how and expertise	
	Acceptance of professional opinions	The degree of acceptance of opinions about one another's knowledge and experience	
	Trust regarding unrivaled knowledge/function	Degree to which each party thinks they have unique knowledge/function	
Speed	Response to decision-making/demand	The degree to which a company responds quickly to decision-making and demand in the supply chain	Gligor et al. (2019); Swafford et al. (2006); Sharifi and Zhang (2001)
	Prompt delivery	The degree to which products are delivered to the market quickly and accurately	
	Response to opportunities/threats	The degree to which a company responds quickly to opportunities and threats in the environment	
Flexibility	Response to requirements/uncertain situations	The degree to which a company responds flexibly to the requirements of partners or unexpected situations	Wang and Wei (2007); Ngai et al. (2011); Sharifi and Zhang (2001); Gligor et al. (2019); Swafford et al. (2006); Khan and Pillania (2008)
	Response to decision-making/production and processes	The degree to which decision-making, production, and processes in the supply chain are flexible	
	Production/delivery date/order quantity	The degree to which the production volume, delivery date, and order quantity respond flexibly to changes in market demand	
	Abnormal order	The degree to which a company responds flexibly to abnormal orders	
	Flexibility for sales (distribution) channels	Degree of flexible variation to new sales (distribution) channels	
Responsibility	Response to changes in the supply chain	The degree to which a company responds appropriately to meaningful changes in the supply chain	Gligor et al. (2019); Swafford et al. (2006)
	Changes in the technological environment/changes in the market	Degree of appropriate response to changes in the technological environment and market	
	Response to quality improvement demands	The degree to which a company responds appropriately to the quality improvement demands of partners	
Logistics performance	Total logistics costs	Logistics-related costs such as transportation, storage, and inventory management	Kannan and Tan (2004)

	Lead time	Time involved in the production and delivery of ordered items	Harrison and New (2002); Gunasekaran (1999); Shin et al.(2000); Baemon (1999)
	Order completion rate	The ability to deliver ordered goods to a specified location within a given time frame and in accordance with conditions	
	Inventory turnover	Annual inventory turnover	
	Logistics quality improvement	Satisfaction level for logistics quality	
	Logistics flexibility increase	Ability to respond flexibly to order fluctuations	

### 4.3. Reliability and Validity Tests

This study was analyzed using SPSS 23.0 and AMOS 23.0 to verify the hypotheses for the research model. Reliability tests were performed to check if consistent results were obtained when the same concept was repeatedly measured using similar or identical measurement tools. The Cronbach's alpha was calculated, and in the field of social sciences, it can be said that reliability is secured when its value is 0.7 or higher (Hair et al., 2014). As a result of the reliability analysis of the variables presented in this study, the following values were obtained: Affective Trust = 0.741, Cognitive Trust = 0.818, Speed = 0.756, Flexibility = 0.831, Responsibility = 0.847, and Logistics Performance = 0.895. Thus, the reliability was secured.

Next, confirmatory factor analysis (CFA) was conducted to test convergent validity, and the results are shown in Table 3 below.

**Table 3:** Results of confirmatory factor analysis

	GF I	RMS EA	CFI	TLI	IFI	AGF I	CMI N/df
Fit Index	0.855	0.063	0.917	0.906	0.919	0.823	1.99
Recommended criteria	Me et 0.9 or more.	Less than 0.08 Suitable	Me et 0.9 or more.	0.9 or more Suitable	0.9 or more Suitable	0.8 or more Suitable	2 or less Suitable

Convergent validity was analyzed using construct reliability (CR) and average variance extracted (AVE). Convergent validity is secured when the value of the CR is 0.7 or more and the AVE is 0.7 or more (Hair et al., 2014). The results of this study are as follows: Affective Trust: AVE = 0.524, CR = 0.767; Cognitive Trust: AVE = 0.582, CR = 0.847; Speed: AVE = 0.542, CR = 0.780; Flexibility: AVE = 0.522, CR = 0.845; Responsibility: AVE = 0.616, CR = 0.864; and Logistics Performance: AVE = 0.593, CR = 0.897.

Finally, to verify discriminant validity, AVE was measured for the measurement variables and the correlation coefficients between them were calculated. The criterion for evaluating discriminant validity is to compare the correlation coefficient between the AVE square root value

and the construct, and if the AVE square root value is greater than the correlation coefficient value, it is judged to have discriminant validity (Hair et al., 2014). The results are shown in Table 4 below.

**Table 4:** Results of discriminant validity analysis

	Affective Trust	Cognitive Trust	Speed	Flexibility	Responsibility	Logistics Performance
Affective Trust	<b>(0.724)</b>					
Cognitive Trust	0.537	<b>(0.763)</b>				
Speed	0.488	0.550	<b>(0.736)</b>			
Flexibility	0.422	0.536	0.562	<b>(0.722)</b>		
Responsibility	0.526	0.609	0.620	0.595	<b>(0.785)</b>	
Logistics Performance	0.350	0.498	0.563	0.533	0.586	<b>(0.770)</b>

### 4.4. Empirical Analysis

In this study, a maximum likelihood estimation of a structural equation model was conducted to verify the proposed hypotheses using AMOS 23.0. The goodness of fit analysis of the structural model showed the following results: GFI = 0.872, CFI = 0.933, TLI = 0.922, AGFI = 0.84, and RMSEA = 0.057; these satisfied the fitness recommendation criteria suggested by Hair et al. (2014). Therefore, hypothesis testing was conducted based on the path analysis model, and the results are shown in Table 5.

**Table 5:** Results of hypotheses testing

Hypotheses	Estimate	S.E.	P	Result
H1-1	0.308	0.103	0.003*	Accepted
H1-2	0.184	0.105	0.81	rejected
H1-3	0.297	0.092	0.001**	accepted
H2-1	0.52	0.113	<0.001***	accepted
H2-2	0.639	0.123	<0.001***	accepted



H2-3	0.561	0.105	<0.001***	accepted
H3-1	0.488	0.155	0.002**	accepted
H3-2	0.27	0.107	0.012*	accepted
H3-3	0.453	0.140	0.001**	accepted
H4	-0.246	0.135	0.069	rejected
H5	-0.018	0.187	0.922	rejected

## 5. Discussion, Implications, and Limitations

### 5.1. Discussion

This study examined the structural relationship between components and factors for successful supply chain management of manufacturing companies. Further, considering the rapidly changing business environment and uncertainty due to COVID-19, this study assumed that a company's efficiency and effectiveness can be improved with the establishment of a supply chain rather than competition between individual companies. Additionally, trust and supply chain agility, which can improve the logistics performance of manufacturing companies that have built a supply chain, were examined, and their relationship was empirically analyzed. The results of assessing the hypotheses set according to this study's purpose are as follows.

First, in terms of the relationship between companies in the supply chain, trust was found to have a partially significant, positive effect in the relationship with supply chain agility. Doney and Cannon (1997) found that mutual affective trust can reduce opportunistic behaviors and allow buyers to act flexibly and quickly when faced with unexpected situations. In this context, Handfield and Bechtel (2002) suggested that the relationship between buyers and suppliers can increase the responsiveness of suppliers without active control if mutual trust is established. Further, Zur et al. (2012) argued that trust is important to respond well to contingencies and that the degree of flexibility in the export industry is likely to increase only when there is trust with the buyer, as well as belief, sacrifice, and confidence. Through this, it can be interpreted that if affective trust is established with a partner, the company can respond quickly to an uncertain environment. This study also found that affective trust has a positive effect on speed and responsiveness.

Affective trust, among the subfactors of trust, and flexibility, a subfactor of supply chain agility, were found to be mutually insignificant. Previous studies show that trust has a positive effect on supply chain agility. However, even if there is affective trust in business relationships with suppliers, because of the characteristics of manufacturing companies in Korea and the uncertain environment,

suppliers cannot respond quickly and flexibly to external changes and uncertain demand. Dowell et al. (2015) found that cognitive trust is more important than affective trust between companies. Also, because a company is formed by a set of individuals, it trusts objective indicators rather than subjective feelings about other companies. This means that flexibility cannot be increased based on a person's emotional judgment, such as emotional bond, values, and ideological homogeneity with suppliers. Therefore, cognitive trust based on rational information or knowledge, such as the competence or skill of other persons, is more important than affective trust in corporate relationships.

Second, in the relationships between companies in the supply chain, supply chain agility has been shown to have a significant positive effect on logistics performance. Thus, responding flexibly and quickly in an uncertain and unpredictable business environment has a positive effect on logistics performance, such as increased inventory turnover, reduced lead time, and reduced logistics costs. Swafford et al. (2006) also empirically analyzed that flexibility as part of supply chain agility can lead to a competitive edge in manufacturing companies, which can improve management performance. Therefore, to improve the logistics performance of manufacturing companies, it is necessary to secure supply chain agility.

Third, trust in the relationship between companies in the supply chain did not appear to have a significant positive effect on logistics performance. This contradicts the results of previous studies that have looked at the correlation between trust and logistics. Specifically, Kollock (1994) found that when mutual trust is formed, uncertainty and transaction costs in transactions can be reduced, and contracts can be concluded flexibly. Also, Hilger et al. (2007) have noted that mutual trust is important to improve logistics performance by reducing logistics costs. Doney and Cannon (1997) found that mutual trust can increase transaction efficiency and reduce transaction costs. However, this study's results show that trust does not yield significant results on logistics performance. This shows that the psychological factor alone cannot improve corporate performance and that corporate performance can be improved only when behavioral factors such as agility, information sharing, and cooperation are accompanied in an uncertain environment.

### 5.2. Implications

In the context of an uncertain business environment and continuously changing customer needs, it has become crucial for companies to build and effectively manage their supply chain. Therefore, in several previous studies related to the supply chain, the necessity of trust, which is a key factor in establishing long-term and cooperative

relationships, was examined. Further, antecedent factors that could affect this trust were explored. The academic implications of this study are as follows.

First, trust contributes to logistics performance through supply chain agility. In previous studies, supply chain agility has been studied as a performance variable; meanwhile, in this study, supply chain agility factors were comprehensively identified to examine how they affect logistics performance. Preceding studies conducted at home and abroad suggest accessibility, alertness, flexibility, speed, and correct decision-making for supply chain agility. This study focused on speed, flexibility, and responsiveness among the items of multidimensional supply chain agility mentioned in a previous study by Sharifi and Zhang (2001). These factors can aid in effectively and efficiently coping with uncertain business environments and unforeseen situations such as COVID-19. Through this, we investigated how speed, flexibility, and responsiveness affect logistics performance. Specifically, it is suggested that the logistics performance for manufacturing companies, speed, flexibility, and responsiveness among supply chain agility be improved, and the necessity of securing an agile supply chain was suggested by empirically verifying the relationship between these factors.

Second, this study analyzed the relationship between trust and supply chain agility among manufacturing companies in South Korea. There are many previous foreign studies on trust and supply chain agility, but Korean studies on the subject are insufficient. According to Liang et al. (2018), trust is the intention to trust and depend on the other party, and Nyaga et al. (2010) found that the long-term direction in the supply chain relationship is determined by how much trust is placed in the counterparty. Additionally, Zur et al. (2012) found that the higher the cognitive and affective trust in a cooperative relationship in international trade, the more flexible the relationship is; further, it has a positive effect on export performance. Handifield and Bechtel (2002) analyzed the relationship between trust and supply chain responsiveness with the collected data. It was suggested that securing a relationship based on trust is important to take agile action with partners, and it is meaningful to examine the relationship between manufacturing companies in South Korea.

This study presents the following practical implications. First, by examining the correlation between trust and supply chain agility, it presents implications for companies in the supply chain. Specifically, affective trust has been shown to have a non-significant effect on flexibility as part of supply chain agility. This shows that affective trust based on emotional bonding, subjectivity, etc., is insufficient to promote flexibility. In business relationships, cognitive trust based on reasonable information or knowledge such as the other party's competence or skill is more important than

affective trust, and manufacturing companies need to make efforts to remove factors that hinder affective trust and build cognitive trust based on capabilities. Second, it suggests that manufacturing companies in a supply chain need to continuously strive for agility. Manufacturing companies need to quickly release a variety of new products to market and flexibly modify existing products to meet end-customer requirements. However, to maintain high productivity in an uncertain environment such as the COVID-19 pandemic, manufacturing companies need to continuously strive for supply chain agility.

### 5.3. Limitations

This study presents academic and practical implications, but it also has some limitations. First, this study used only logistics performance to measure the performance of manufacturing companies. However, there are various other tools that can measure corporate performance, such as supply chain management performance, operational performance, and financial performance. Therefore, empirical studies conducted on a macroscopic range using various indicators would have great academic significance. Further, because the samples used in this study were practically excluded specific comparisons of company size and industry, it is difficult to generalize the results of this study. Therefore, future research must broaden the scope of the sample and use balanced data.

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