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Collaborative Communication, Information Sharing and Supply Chain Performance

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Abstract

Purpose: This study empirically investigates the effect of collaborative communication and information sharing on the supply chain performance of South Korean pharmaceutical companies. Specifically, it understands the importance collaborative communication and suggests a method for investigating communication in academic research on the pharmaceutical industry. Investigating this sector is crucial because the importance of the pharmaceutical industry is increasing globally against the background of the Covid-19 pandemic. **Research design, data, and methodology:** A questionnaire was administered to employees of South Korean pharmaceutical companies and 244 valid responses were used for the statistical analysis. Additionally, structural equation modeling was used to measure the relationships between the observed and latent variables. **Results:** Collaborative communication has a positive effect on information sharing. However, information sharing, unlike collaborative communication, does not exhibit a significant positive relationship with supply chain performance. These results indicate that it is important to communicate effectively in the supply chain rather than strive for the right type of information sharing. **Conclusions:** Consumers and retailers within the supply chain should continue to strive for candid communication. This study is meaningful, as it empirically tests the relationships between collaborative communication, information sharing, and supply chain performance in the South Korean pharmaceutical industry.

Keywords: Collaborative Communication, Information Sharing, Supply Chain Performance, Pharmaceutical

JEL Classification Codes: F20, I19, M00, M30

1. Introduction

In today's intensely competitive business environment, firms build supply chains and then compete among them and not individually (Cigolini et al., 2004). Supply chain management (SCM) can be considered as a strategy to manage partners within the supply chain efficiently and build long-term partnerships (Fynes et al., 2008), thereby enabling each firm to respond quickly to rapidly changing markets. The main concern of research on SCM is the effort firms invest in cooperation and information sharing within the supply chain (Yang et al., 2008). In this study, collaborative communication is presented as a prerequisite for the smooth sharing of information, as effective communication with management partners is an essential factor for sharing information and knowledge (Mohr et al., 1996).

The goal of communication is to exchange information with others and achieve individual, social (Blackstone et al., 2007), and enterprise goals (Calculator, 2009). In other words, communication is crucial to organizational life (Reinsch, 2001) because firms can develop knowledge or capabilities through communicative interaction (Ballantyne & Varey, 2006). Collaborative communication is important because the ability of an organization can be improved when it develops knowledge or capabilities. Moreover, it

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can play a key role in developing and maintaining the relationship between consumers and retailers (Meek et al., 2011). Hence, various communication-related studies within the business context have been conducted.

First, prior research in marketing-related fields shows that collaborative communication has a positive effect on improving inter-organizational relationships and organizational performance (Schultz & Evans, 2002). This communication is crucial within the supply chain and, as Cousins and Menguc (2006) highlighted, performance improves in the presence of effective communication. Communication is the foundation of management and supply chains (Reinsch, 2001). Several prior studies that have evaluated the role of communication in the relationship between consumers and retailers have explored it as a mediator between the independent and dependent variables (Paulraj et al., 2008). However, this study establishes collaborative communication as an independent variable and observes its effects on information sharing and supply chain performance.

Meanwhile, Ryu (2019) stated that competition in business equates to competition between supply chains rather than individual competition. Khan et al. (2016) highlighted that information sharing is a key factor in sustainable SCM. Information sharing refers to the extent to which important information is communicated to partners within the supply chain (Yu et al., 2001). Various prior studies have emphasized that information sharing is important in SCM (Hammervoll et al., 2012). Barratt's (2004) research showed that open communication and information sharing is necessary to establish an efficient supply chain. However, most preceding studies were conducted from the perspective of large companies, whereas studies focusing on specific industries are scarce. Therefore, this study examines how collaborative communication and information sharing affect supply chain performance in the pharmaceutical industry.

Specifically, this study explores the influence of collaborative communication on information sharing and investigates the relationship between information sharing and supply chain performance. Haque and Islam (2018) explored the effect of information sharing on customer satisfaction in Bangladesh's pharmaceutical industry. The present study suggests that information sharing is a prerequisite for supply chain performance. Thus, it investigates the causal relationship between collaborative communication and medical industry supply chain performance observed in relation to pharmacists (consumer) and pharmaceutical firm employees (retailer) in South Korea. Investigating this sector is crucial because the importance of the pharmaceutical industry is increasing globally against the background of the Covid-19 pandemic.

Specifically, the purpose of this study is to:

-Identify the influence of collaborative communication on information sharing and supply chain performance

-Understand the importance of collaborative communication

-Suggest a method for investigating communication in academic research on the pharmaceutical industry

The remainder of this paper is organized as follows: The next section presents a literature review, after which the hypothesis are established. This is followed by a discussion on the data collection process and measurement of the variables. The subsequent section presents the study's methodology. The last section proposes implications and concludes.

2. Literature Review

This study examines the importance of collaborative communication and the appropriate level of information sharing within the supply chain.

2.1. Collaborative Communication

Communication means sharing thoughts and opinions through language. Additionally, efficient inter-firm communication is necessary to establish a strategy that can generate revenue in a fiercely competitive business environment (Chamidah et al., 2020). Therefore, collaborative communication is one of the competitive resources a firm should develop in a rapidly changing market. Utilizing effective communication has been addressed in research on strategy, marketing, and organizational behavior. An entity can obtain important information and knowledge through communication with other entities and develop relationships with customers (Ballantyne & Varey, 2006). Chen et al. (2004) cited close cooperation, open communication, and corporate capabilities as essential factors to gain a sustainable competitive advantage. Therefore, it is vital for an entity to maintain relationships with other firms through regular communication (Paulraj et al., 2008). If communication is not efficient, a firm may have difficulty developing its strategy (Hutt et al., 2000). Additionally, communication and information sharing are important for establishing an effective relationship between organizations (Modi & Mabert, 2007). Fugate et al. (2009) argued that effective communication is an important factor for improving supply chain operations. Therefore, to improve supply chain performance, steady and close communication with partners within the supply chain must be maintained.

Mohr and Nevin (1990) found that frequency, direction, and content are components of collaborative communication, whereas Joshi (2009) discussed frequency,

rationality, and reciprocal feedback. However, various studies of collaborative communication measure similar dimensions for the level of communication based on several factors. This points to a lack of research into the factors needed to communicate cooperatively. We interviewed three employees from the South Korean pharmaceutical industry before this study, who stated that when there is frequent, open, and smooth communication, collaborative communication can be achieved between pharmaceutical companies and pharmacists. Therefore, this study presents candid, smooth, and frequent communication as a measure of collaborative communication.

2.2. Information Sharing

Information sharing refers to the sharing of information on a firm's financial, production, and market activities (Kim & Song, 2013). It is a significant factor in integrating the supply chain, as firms within the chain can benefit from such information. Huang et al. (2015) argued that integration is an important factor in the pharmaceutical industry's supply chain. Thus, pharmaceutical firms should establish a steady and appropriate information sharing process when communicating with governments, hospitals, and pharmacies, which are part of its supply chain. De Toni et al. (2011) argued that sharing knowledge is the most important strategy for businesses. Information sharing is also critical within the supply chain because efficient information sharing improves performance (Zhou & Benton, 2007). On the contrary, inefficient sharing can lead to the bullwhip effect (Lee et al., 1997), which refers to situations in which orders to retailers tend to fluctuate more than sales to consumers do. They move upstream within the supply chain in an amplified form of distorted information (Disney & Towill, 2003).

Uncertainty occurs when complete information is not obtained. Yu et al. (2001) explained that although the firm has complete information about itself, it lacks information about other members of the supply chain. Therefore, to reduce uncertainty, sufficient information must be secured from partner companies in the supply chain. Premkumar (2000) demonstrated that information sharing reduces uncertainty in supply and demand, which can benefit all the firms in the supply chain. Chen et al. (2000) demonstrated through empirical research that efficient information sharing reduces the extent of the bullwhip effect, concluding that the accurate sharing of information benefits the supply chain. Sambasivan et al. (2009) found a strong relationship between an organization's sharing of knowledge and its performance. Consequently, by sharing knowledge, organizations can improve performance and avoid redundant learning efforts (Calantone et al., 2002).

As mentioned earlier, the consolidation of the supply chain is important in the pharmaceutical industry. Past research focuses on various aspects of supply chain integration, which enable the flow of materials and parts, cash flow, and information, depending on the study's purpose (Flynn et al., 2010). Therefore, this study focuses on information sharing between pharmaceutical company employees and pharmacists. Haque and Islam (2018) argued that sharing information about purchases, production, and marketing can create a true knowledge value chain. The content of such shared information can be classified into supplier, producer, customer, and distribution information, among others (Handfield et al., 2000). In this study, information sharing within the pharmaceutical industry was measured based on supplementary medical supplies, substitutable medical supplies, and sales plans.

2.3. Supply Chain Performance

Barratt (2004) argued that trust, open communication, and information sharing among firms in a supply chain are important for its smooth operation. This study examines the effect of collaborative communication and information sharing on supply chain performance, which is measured by a variety of variables. Sustainable supply chain performance refers to a combination of sustainability and SCM. Sustainability means efficiently managing resources in the present to secure future operations (Jacobs & Chase, 2014). Various factors of sustainable SCM can maximize supply chain profit and the common interest of society (Hassini et al., 2012). Achrol et al. (1983) stated that regulations and laws are required for business activities, whereas Steurer et al. (2005) went further and pointed out that economic, ethical, and social responsibilities are necessary for sustainable SCM. Carter and Rogers (2008) argued that in the SCM context, the relationship between the seller and buyer as well as the environmental, social, and economic outcomes and goals are based on firms' strategic activities. Companies' efforts to manage the supply chain, such as improving quality, finance, delivery date, flexibility, and competitiveness to reflect the interests of the environment, society, and economy, can thus be interpreted as sustainable SCM (Giannakis & Papadopoulos, 2016).

In advanced research, sustainable SCM is classified into social, economic, and environmental factors. Kim and Song (2019) argued that supply chain performance can be divided into qualitive and quantitive. However, in this study, social and environmental sustainability were unsuitable for measuring sustainable SCM in the relation between pharmaceutical firms and pharmacies. Therefore, only economic variance was considered when defining the variable measuring sustainable SCM. In this study,

sustainable supply chain performance refers to sales growth, relationship maintenance, performance improvement, and production improvement (Carter & Easton, 2011; Carter & Rogers, 2008; Jacobs & Chase, 2014).

3. Hypothesis Development

3.1. Collaborative Communication and Information Sharing

Carr and Pearson (1999) argued that sharing important information within the supply chain not only improves the quality of the product and reduces customer response time, but also results in cost savings. Additionally, if accurate information is shared at an appropriate time, it can lead to successful strategic alliances (Chen & Paulraj, 2004). Therefore, to improve the performance of a firm and enhance its survival in a competitive environment, face-to-face interaction is necessary. Wognum et al. (2002) argued that face-to-face interactions between consumers and retailers are an important aspect of information sharing. Mohr et al. (1996) stated that information and knowledge can be shared through communication. Kale et al. (2000) explained that regular communication is highly likely to foster beneficial relationships within each firm through open and smooth communication. When sharing information on products, services, and markets, among others, communication is essential to gain mutual benefits. Anderson and Weitz (1992) claimed that cooperation and trust could be built through communication. Based on these arguments, the following hypothesis is proposed.

H1: Collaborative communication affects information sharing positively.

3.2. Information Sharing and Supply Chain Performance

Information is defined as the set of facts necessary for decision making in relation to a task (Gigone & Hastie, 1993). Sharing this information can improve performance within the supply chain (Lee et al., 2020). Sanchez-Rodriguez et al. (2005) argued that if the right information sharing between consumers and retailers takes place in the supply chain, it will reduce logistics costs and raise customer satisfaction. Sako's (2004) empirical study also found that the higher the level of information sharing, the lower is the inventory level and the more satisfied are customers. As the efficient sharing of information is an essential factor in improving supply chain performance, uncertain information sharing can negatively affect the entire supply chain in various ways, such as causing a bullwhip effect.

Aoki and Takizawa (2002) proposed two mechanisms through which smooth information sharing can improve the performance of an enterprise. First, it is possible to coordinate future strategies between consumers and retailers. The supply chain is then able to respond quickly to rapidly changing markets based on the shared information. Consequently, information sharing within the supply chain is expected to help secure competitiveness in the market and improve firms' performance. Accordingly, information sharing is expected to affect performance. Based on this, the following hypothesis is proposed.

H2: Information sharing affects supply chain performance positively.

3.3. Collaborative Communication and Supply Chain Performance

Prior empirical studies of the relationship between collaborative communication and business performance is lacking. However, based on the following prior studies, one can guess at the relationship. First, Prahinski and Benton (2004) stated that cooperative communication strengthens the relationship between consumers and retailers. Kale et al. (2000) argued that open and smooth communication can create mutual benefits and is the foundation for strengthening relationships between firms. Efficient communication can also reduce the errors associated with products and services, leading to increased customer responsiveness (Chen & Paulraj, 2004). Paulraj et al. (2008) explained that through communication, companies can improve their operational efficiency and quality, thereby gaining competitive advantage.

Figure 1 illustrates the research model to be tested.

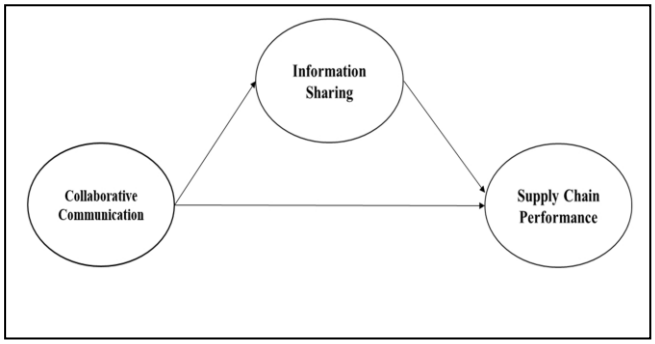

Figure 1: Research Model

On the contrary, communication is a set of patterns formed by exchanging information among parties (Monge

et al., 1981). Such a collaborative attitude can create an environment of respect and mutual support among supply chain members (Morgan & Hunt, 1994). This communication also plays a key role in members receiving mutual benefits. Chen et al. (2013) argued that collaborative communication increases the number of relationships, which improves performance. As the relationship between the consumer and retailer is strengthened through collaborative communication, which increases customer responsiveness and improves the quality of products and services, the following hypothesis is established.

H3: Collaborative communication affects supply chain performance positively.

4. Methods

4.1. Sample

This study surveyed employees from South Korean pharmaceutical companies to empirically observe the links among collaborative communication, information sharing, and supply chain performance in the relationships between pharmacies and pharmaceutical companies. It sought advice on the questionnaire items from pharmaceutical employees and pharmacists in February 2018 to verify the validity of the content before the distribution of the final version of the questionnaire. To this end, we randomly visited pharmacies and pharmaceutical firms and received advice on the survey from three people. The survey was then conducted via post and through in-person visits. Seven hundred survey forms were distributed over the four months from March 2018 to collect data and 268 responses were collected, showing a 38.3% response rate. Among the responses, 24 were excluded because of incomplete data or because the questionnaires consistently answered with one number. The remaining 244 responses were used for the statistical analysis.

Table 1: Sample Characteristics

	Category	Frequency	Percentage (%)
Sex	Male	230	94.26
	Female	14	5.74
Age	20s	61	25.00
	30s	126	51.64
	40s	55	22.54
	50s	2	0.82
Number of Partner Pharmacies	1–10	50	20.49
	11–20	65	26.64
	21–30	51	20.90
	>30	78	31.97

Table 1 shows the demographic details of the sample. Respondents in their 30s and 40s constitute the greatest proportions, at 51.64% and 22.54%, respectively. Over 75% of the companies are in business relationships with more than 10 pharmacies.

4.2. Measurement Variables

The survey included three main parts: “collaborative communication”, “information sharing” and “supply chain performance.” Collaborative communication and information sharing had an additional three subcategories and supply chain performance contained four subcategories. Each category was evaluated on a five-point Likert scale, with 1 being “highly disagree” and 5 being “highly agree.”

First, the items used to measure collaborative communication were based on Joshi (2009) and Mohr and Nevin (1990). They were adapted slightly to suit the purpose of this study and measured the relationship between the consumer and retailer. Additionally, “candid communication”, “frequent communication” and “easy communication” were used as the measured items for collaborative communication.

The items measuring information sharing were taken from the empirical studies of Cao and Zhang (2011) and Lee and Ha (2020). Information sharing was redefined to suit the pharmaceutical context and the following measurement items were utilized: “supplementary medical supplies”, “substitutable medical supplies” and “sales plan.”

Finally, the outcome variable, supply chain performance, was based on the measurement items used in Carter and Easton’s (2011) and Carter and Rogers’ (2008) empirical studies. Additionally, “sales growth”, “relationship maintenance”, “performance improvement” and “productivity improvement” were used as the measures. The respondents were required to assess the degree of improvement in the overall performance of the firm in terms of these items in transactions with pharmacists.

4.3. Reliability and Validity Tests

In this study, structural equation modeling was used to verify the hypothesis because of its numerous advantages. First, various statistical analyses such as regression analysis, factor analysis, and correlation analysis can be performed at once. In addition, latent variables are available and confirmatory factor analysis is possible. Finally, measurement errors for exogenous and endogenous variables can be considered (Hair et al., 2010). Before testing the hypothesis, the reliability and validity of the measurement variables were checked. Cronbach’s alpha determines whether the same measurement values can be obtained when measurements are repeated for the same

concept. According to Ursachi et al. (2015), reliability is considered to be secured when Cronbach's alpha is above 0.6. Because all the questions from the surveys had Cronbach's alpha values above 0.6, the study was deemed to be reliable.

Next, confirmatory factor analysis was conducted to test convergent validity and review the adequacy of the structural equation model, including confirmatory factors. The goodness-of-fit indices were measured for the model presented and the research model was determined to be acceptable based on these indices' satisfaction of the recommended levels: CMIN/DF=1.986, RMR=0.050, GFI=0.952, CFI=0.953, TLI=0.930, and RMSEA=0.064 (Hair et al., 2010).

Next, the average variance extracted (AVE) and construct reliability (CR) values were calculated to obtain convergent validity. All the AVE values were above 0.5 and the CR values were above 0.7, showing statistical significance. Table 2 presents the results of the convergent validity test.

Table 2: Convergent Validity Test Results

	Cronbach's Alpha	AVE	CR
Collaborative Communication	0.682	0.577	0.800
Information Sharing	0.681	0.514	0.743
Supply Chain Performance	0.708	0.508	0.804

Lastly, the AVE for each variable was used to analyze discriminant validity, and the correlation coefficients between the variables were calculated. Discriminant validity was considered as secured, as the AVE of each variable was larger than the square root of the correlation between the variables. Table 3 presents the results of the discriminant validity analysis.

Table 3: Analysis of the Mean, Standard Deviation, and Correlation of the Variables

	Mean	Std. Dev.	Collaborative Communication (1)	Information Sharing (2)	Supply Chain Performance (3)
(1)	3.448	0.868	0.577	-	-
(2)	3.206	0.947	0.269	0.514	-
(3)	3.550	0.785	0.398	0.194	0.508

4.4. Hypothesis Testing

The indices of the structural equation model for the hypothesis tests were CMIN/DF=1.986, RMR=0.050, GFI=0.952, CFI=0.953, TLI=0.930, and RMSEA=0.064, and most satisfied the goodness-of-fit criteria suggested by Hair et al. (2010). Accordingly, the hypothesis were tested based on the path analysis model. The results of the hypothesis tests showed that collaborative communication has a significant effect on information sharing. This means that if communication is uncooperative in consumer–retailer relationships, the sharing of information is not properly achieved. Meanwhile, information sharing does not have a significant effect on supply chain performance in contrast to the findings of previous studies. Lastly, collaborative communication has a significant effect on supply chain performance. This result indicates that it is important to communicate effectively to improve supply chain performance. Table 4 presents the results of the hypothesis testing.

Table 4: Hypothesis Testing Results

Hypothesis	Estimate	SE	CR	p	Result
1	0.272	0.063	4.342	< 0.001	Supported
2	0.223	0.137	1.627	0.104	Rejected
3	0.414	0.080	5.174	< 0.001	Supported

5. Discussion

5.1. Results and Implications

This study observes collaborative communication between consumers and retailers within the supply chain and examines its influence on information sharing and supply chain performance. Specifically, we focus on the trading relationship between pharmaceutical employees (retailers) and pharmacists (consumers) and derive several implications of collaborative communication to strengthen information sharing within the medical industry supply chain. The study also shows that effective interpersonal communication can raise business performance.

According to the findings of this study, collaborative communication has a positive effect on information sharing. This can be interpreted as the need for communication to be cooperative to strengthen the trading relationship and provide the right information. Therefore, companies in the

supply chain must communicate with each other to strengthen information sharing. It is important that candid and smooth communication occurs frequently. Therefore, for effective information sharing, an environment encouraging mutual communication must be established.

Information sharing does not have a significant effect on supply chain performance. Generally, there is a difference between the needs and objectives of the consumer and retailer (Gules & Burgess, 1996). Therefore, information sharing between them is likely to vary depending on the purpose. However, according to prior studies, information sharing contributes to supply chain cooperation, which improves supply chain performance. Thus, pharmaceutical employees and pharmacists, both retailers and consumers within the pharmaceutical supply chain, should share information on substitutable medicines, supplementary medicines, and sales plans.

Lastly, collaborative communication has a positive effect on supply chain performance. Chen and Paulraj (2004) argued that effective communication may improve customer responsiveness and reduce product errors. This is congruent with the argument that collaborative communication with partners in the supply chain can generate mutual benefits (Kale et al., 2000). According to the findings of this study, collaborative communication can contribute to supply chain activities by increasing the efficiency of information sharing. Furthermore, because it contributes to improving supply chain performance, consumers and retailers within the supply chain must facilitate mutual communication.

This study's contributions can be summarized as follows.

1. The research focuses on the performance of pharmaceutical firm employees, or retailers, within the medical industry supply chain. Paulraj et al. (2008) argued in a study focused on collaborative communication and corporate performance that scant focus has been placed on the performance of suppliers. This study judged that it was important to explore those factors that improve supplier performance and investigated the role of collaborative communication and information sharing as the leading factors affecting supply chain performance.

2. This study considered the effectiveness of communication in relation to pharmacists and pharmaceutical firm employees. Several studies have explored the role of communication to reflect the trading characteristics of consumers and retailers; however, studies of specific industries are lacking. Boyle and Kochinda (2004) investigated the role of collaborative communication in the relationship between doctors and nurses. However, related research on the pharmaceutical industry is limited. This research is therefore meaningful, as it reflects the real-world relationships between South Korean pharmacies and pharmaceutical companies in terms of their collaborative communication, information sharing, and supply chain performance.

3. Collaborative communication was presented as a factor in improving supply chain performance. Many prior studies have explored the role of communication as a moderator of the dependent and independent variables. However, after establishing collaborative communication as an independent variable, this study noted its effect on information sharing and supply chain performance.

This study presents the following practical implications.

1. Pharmaceutical companies and pharmacies should actively manage supply chain performance. The results show that collaborative communication has a significant effect on supply chain performance. These results suggest that in the relationship between consumers and retailers within the supply chain, efforts should be made to ensure that effective communication is achieved. Therefore, consumers and retailers within the medicine supply chain must constantly strive to create an environment in which candid and frequent communication without falsehood can be achieved.

2. Prior research categorizes the relationship between consumers and retailers as either hostile or cooperative (Lamming & Hampson, 1996). Thus, each party's motivation within a supply chain relationship could differ from that of its partner. Although the effect of information sharing on the supply chain was shown to be insignificant in this study, as many prior studies have demonstrated, companies participating in information sharing need to understand each other's motives and build cooperative relationships to improve supply chain performance.

3. This study explored the impact of collaborative communication on information sharing and supply chain performance in South Korean pharmaceutical companies. Research on the relationship between pharmaceutical companies and pharmacies focusing on supply chains is insufficient. As mentioned in the Theoretical Background, sharing accurate and relevant information between parties requires cooperative communication, which can benefit all organizations. Hence, to share information smoothly in the uncertain environment due to the current Covid-19 pandemic, South Korean pharmaceutical companies need to build beneficial relationships with each company through cooperative communication based on mutual trust.

5.2. Research Limitations and Suggestions

Although this study offers several implications, it has the following limitations.

1. It only considered information sharing, one of the factors in supply chain cooperation between consumers and retailers. This is one of the variables that represents supply

chain cooperation, and related studies could explore it in greater detail. Therefore, future research should be conducted from a more comprehensive perspective, including other factors of supply chain cooperation.

2. The sample used in this study consisted only of employees of South Korean pharmaceutical companies. In future research, it is necessary to collect data from other countries. Such data on collaborative communication, information sharing, and supply chain performance could lead to clearer implications.

6. Conclusion

This study identifies the relationships among collaborative communication, information sharing, and supply chain performance and finds that communication has a positive effect on supply chain performance. Therefore, consumers and retailers within the supply chain should strive to ensure that cooperative communication is achieved, which will enable them to form long-term and friendly trading relationships, improving supply chain performance. Additionally, honest and smooth communication between pharmacists and pharmaceutical firm employees is required for the successful deployment and management of the medical supply chain.

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