


THE EFFECT OF SUPPLY CHAIN RISK MANAGEMENT ON LOGISTICS PERFORMANCE AND INNOVATION PERFORMANCE

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ARTICLE INFO	ABSTRACT
<p>Article history:</p> <p>Received 31 July 2023</p> <p>Accepted 30 October 2023</p>	<p>Purpose of the Study: The main objective of this paper is to describe the multidimensionality of supply chain risk and evaluate supply chain risk management in association with logistics performance and innovation performance.</p>
<p>Keywords:</p> <p>Supply Chain Risk Management; Innovation Performance; Logistics Performance.</p> 	<p>Theoretical framework: No study was found that analyzes the impact of supply chain risk management on logistics performance and innovation performance in the literature review. The purpose of this study is to close this gap in the existing literature.</p> <p>Design/methodology/approach: This study leverages a data set of 30 medium-sized technology firms in Turkey. The first part of the analysis aims at finding determinants of supply chain risk management, and the second part is the analysis of supply chain risk management, innovation performance, and logistics performance. Structural equation modeling multivariate statistical technique is chosen.</p> <p>Findings: Consequently, it empirically proves that risk mitigation and risk control affect positively innovation performance. It concludes that only risk control is effective in increasing logistics performance. Moreover, it estimates that risk identification and risk assessment will have a significant regulatory effect on performance. However, this study explains that they don't have a positive effect on the results.</p> <p>Research, Practical & Social implications: Research gaps and opportunities are presented to lead further studies about supply chain risks in different sectors. This paper is hopefully purposed to contribute to sector representatives as a guide.</p> <p>Originality/value: This study contributes to our understanding of how and with whom to collaborate by highlighting the relationships among supply chain risk management, innovation performance, and logistics performance.</p> <p>Doi: https://doi.org/10.26668/businessreview/2023.v8i11.3164</p>

O EFEITO DA GESTÃO DE RISCOS DA CADEIA DE FORNECIMENTO NO DESEMPENHO LOGÍSTICO E NO DESEMPENHO DA INOVAÇÃO

RESUMO

Objetivo do Estudo: O objetivo principal deste artigo é descrever a multidimensionalidade do risco da cadeia de suprimentos e avaliar a gestão do risco da cadeia de suprimentos em associação com o desempenho logístico e o desempenho da inovação.

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Referencial teórico: Não foi encontrado nenhum estudo que analise o impacto da gestão de riscos da cadeia de suprimentos no desempenho logístico e no desempenho da inovação na revisão da literatura. O objetivo deste estudo é preencher essa lacuna na literatura existente.

Design/metodologia/abordagem: Este estudo utiliza um conjunto de dados de 30 empresas de tecnologia de médio porte na Turquia. A primeira parte da análise visa encontrar determinantes da gestão de riscos da cadeia de abastecimento, e a segunda parte é a análise da gestão de riscos da cadeia de abastecimento, do desempenho da inovação e do desempenho logístico. A técnica estatística multivariada de modelagem de equações estruturais é escolhida.

Constatações: Consequentemente, prova empiricamente que a mitigação e o controle de riscos afetam positivamente o desempenho da inovação. Conclui que apenas o controle de riscos é eficaz para aumentar o desempenho logístico. Além disso, estima que a identificação e a avaliação dos riscos terão um efeito regulamentar significativo no desempenho. No entanto, este estudo explica que eles não têm um efeito positivo nos resultados.

Implicações de investigação, práticas e sociais: São apresentadas lacunas e oportunidades de investigação para conduzir mais estudos sobre os riscos da cadeia de abastecimento em diferentes sectores. Esperamos que este documento tenha como objetivo contribuir para os representantes do setor como um guia.

Originalidade/valor: Este estudo contribui para a nossa compreensão de como e com quem colaborar, destacando as relações entre a gestão de riscos da cadeia de abastecimento, o desempenho da inovação e o desempenho logístico.

Palavras-chave: Gestão de Riscos na Cadeia de Suprimentos, Desempenho de Inovação, Desempenho logístico.

EL EFECTO DE LA GESTIÓN DE RIESGOS DE LA CADENA DE SUMINISTRO SOBRE EL DESEMPEÑO LOGÍSTICO Y EL DESEMPEÑO DE LA INNOVACIÓN

RESUMEN

Propósito del estudio: El objetivo principal de este documento es describir la multidimensionalidad del riesgo de la cadena de suministro y evaluar la gestión del riesgo de la cadena de suministro en asociación con el desempeño logístico y el desempeño de la innovación.

Marco teórico: No se encontró ningún estudio que analice el impacto de la gestión de riesgos de la cadena de suministro en el desempeño logístico y el desempeño de la innovación en la revisión de la literatura. El propósito de este estudio es cerrar esta brecha en la literatura existente.

Diseño/Metodología/Enfoque: este estudio aprovecha un conjunto de datos de 30 empresas tecnológicas medianas en Turquía. La primera parte del análisis tiene como objetivo encontrar determinantes de la gestión de riesgos de la cadena de suministro, y la segunda parte es el análisis de la gestión de riesgos de la cadena de suministro, el desempeño de la innovación y el desempeño logístico. Se elige la técnica estadística multivariada de modelado de ecuaciones estructurales.

Hallazgos: En consecuencia, demuestra empíricamente que la mitigación y el control de riesgos afectan positivamente el desempeño de la innovación. Se concluye que sólo el control de riesgos es eficaz para aumentar el rendimiento logístico. Además, estima que la identificación y evaluación de riesgos tendrán un efecto regulatorio significativo sobre el desempeño. Sin embargo, este estudio explica que no tienen un efecto positivo en los resultados.

Implicaciones prácticas, Sociales y de Investigación: se presentan lagunas y oportunidades de investigación para liderar estudios adicionales sobre los riesgos de la cadena de suministro en diferentes sectores. Se espera que este documento sirva de guía a los representantes del sector.

Originalidad/valor: este estudio contribuye a nuestra comprensión de cómo y con quién colaborar al resaltar las relaciones entre la gestión de riesgos de la cadena de suministro, el desempeño de la innovación y el desempeño logístico.

Palabras clave: Gestión de Riesgos en la Cadena de Suministro, Desempeño de Innovación, Desempeño Logístico.

INTRODUCTION

In today's global and dynamic competitive environment, as well as providing products and services that meet the needs and expectations of customers, focusing on innovation in the

supply chain and developing strategies to increase logistics performance play a key role in achieving sustainable competitive advantage. Nowadays, the increasing demand for mass customization in many industries has led to complexity in the supply chain, resulting in disruptions in the supply chain. The supply chain risk can deeply affect other actors. If low-impact risk events occur simultaneously, they can snowball and cause serious problems in the supply chain (Vilko & Hallikas, 2012). The Covid-19 virus, which emerged in Wuhan, China, spread to the world in a very short time. The global pandemic has caused disruptions in regional and international supply chains, logistics blockages have occurred in transportation corridors. The supply and demand imbalances caused to burst up many businesses in the supply chain. More than 200 of the Global 500 companies are located in the industrial city of Wuhan, where the epidemic originated and was most affected. Most of the world's leading global automakers source their parts from China. The COVID-19 epidemic, which first appeared in China and spread all over the world, deeply affected the automotive industry (Kalkan et al. 2021). Logistics and financial crises erupted in the civil aviation industry due to the Covid-19 pandemic. Airlines began to suspend their operations or to suspend all their flights. Disruptions in the supply chain have negatively affected the performance of companies (Zakaria et al. 2023).

Bosch lost millions of dollars from selling damaged pumps to its customers in 2005. The main reason for this situation is due to the supplier. Ericsson was working with Philips, which offered low cost and fast delivery. Production had to be interrupted in 2000 due to a fire in the Phillips semiconductor factory, which is the sole supplier to Ericsson. The 2001 loss resulted in \$400 million as Ericsson had no other chip supplier. A leak in NIKE's demand planning software caused a supply bottleneck for the Air Jordan model that would be released that summer in 2000. Due to this leak, NIKE has announced an estimated \$100 million in lost sales. Due to the 2005 Katrina and Rita hurricanes, most of them could not be supplied with oil and natural gas, and nearly 28% of the total energy production stopped. Global companies such as BP, Shell, Conoco Phillips, and Lyondell suffered billions of dollars in losses in these hurricanes (Handfield et al. 2007).

The terrorist attacks in the United States of America on September 11, affected some companies indirectly, and Ford and Toyota stopped their production there due to supply disruptions in 2011. The earthquake that occurred in Japan in 2011, the tsunami, and the ensuing nuclear crisis caused Toyota's production to drop by 40,000 vehicles, resulting in \$72 million a day (Pettit et al. 2013). The catastrophic flood in Thailand in October 2011 adversely affected

the supply chains of computer manufacturers dependent on hard drives and disrupted the supply chains of Japanese automotive companies with facilities in Thailand (Chopra & Sodhi 2014). The way to respond instantly to demands in the supply chain and to ensure high customer satisfaction is through effective information systems. Innovation is important in eliminating disruptions in the supply chain and reducing supply chain risks (Giannakis & Louis, 2011). Organizational, environmental, and risks in the supply chain directly affect the success of innovation (Roberts & Amit, 2003).

Since the beginning of the Industrial Revolution, innovation has been instrumental in creating new products for to market by utilizing knowledge technological skills, and experience. The actors in the supply chain are the source of the development of innovation and the formation of technological opportunities in international markets. Based on the mentioned literature, the objectives of this review are to:

- (1) Providing a comprehensive definition of supply chain risk management, logistics performance, and innovation performance. Hope to contribute to a better understanding of the concept of supply chain risks.
- (2) Our basic research objective is to analyze the effect of supply chain risk management on logistics performance and innovation performances.
- (3) Presenting a guide to industry representatives on supply chain risk management and performance.

THEORETICAL FRAMEWORK

Supply Chain Risk Management

Nowadays, supply chain risks are becoming more popular both in academic studies and in the business world. Supply chain risks have been categorized in many different ways in the literature. Supply chain risk management is an effective factor in identifying potential threats in international markets and taking action in this direction in this time of intense competition (Wieland & Marcus Wallenburg, 2012). This management approach plays a leading role in reducing operational losses and increasing supply chain performance, as well as providing timely delivery of orders and increasing responsiveness (Munir et al. 2020). Lin and Zhou (2011) and Olson and Wu (2010) defined operational supply chain risks as internal risks (demand risks), and external risks (natural disasters, wars, terrorism, political instability).

Ravindran et al. (2010) identified the risks as late delivery and missing quality requirements. Samvedi et al. (2013) classified risks such as supply, demand, process, and

environmental risks. Blackhurst et al. (2008) described supply chain risks as supplier dependency, quality problems, security risks, disruptions in logistics processes, information systems problems, capacity shortages, and natural disasters. Wuni et al. (2019) analyzed 39 empirical studies within the framework of supply chain risks and identified 30 critical risk factors. Ho et al. (2015) evaluated supply chain risk types and risk reduction strategies by making use of their academic studies in the field of supply chain risk management between 2003 and 2013.

On the other hand, Pham et al. (2022) emphasized that while academic studies focus on identifying risks, there are not many studies on risk reduction. Waqas et al. (2022) investigated that knowledge management has a moderator effect on the relationship between food supply chain risks and supply chain performance in Malaysia. Shenoj et al. (2016) concluded that supply chain risk management has a mediating role and has a positive effect on the relationship between supply chain risks and supply chain performance. Giannakis and Louis (2011) developed a multi-agent-based decision support system to detect interruptions and disruptions in supply chain processes and to reduce supply chain risks. Thus, it leads to sharing information more quickly and reliably throughout the supply chain.

Logistics Performance

Logistics has become the backbone of the global economy today. It is an integrated structure that plays a locomotive role between production and consumption and creates added value to the sectors with its many activities (such as purchasing, customs clearance, insurance, storage, distribution, transportation, stock management, demand forecasting, order management...) Logistics activities are interrelated processes. It is important to use resources effectively and efficiently in the process from the procurement stage to the final consumer by providing material, information, and capital flow to meet customer needs and requirements. In these processes, information technologies are effective in increasing logistics performance. The faster and more flexible the logistics system is, the more customer needs will be met as soon as possible, thus creating customer satisfaction. In addition, efficient logistics operations will save costs (Yangınlar & Arslan, 2019).

Today, it is vital for suppliers, manufacturers, wholesalers, retailers, and freight forwarders who want to gain a competitive advantage to focus on logistics performance measurement and develop strategies to improve logistics performance (Harrison & New, 2002). Logistics performance measurement is not a choice but a necessity for businesses in the supply

chain (Novack & Thomas, 2004). Logistics performance includes many criteria such as delivery time, on-time delivery, short transit time, delivery in periods of high demand, delivery without damage, delivery of urgent orders, and order fulfillment rates (Vieira et al. 2015). Time, cost, and reliability criteria are considered in measuring the logistics performance in the supply chain (Hotrawaisaya et al. 2014). Xuan et al. (2023) concluded that logistics performance criteria such as cost, time, and capacity have a positive effect on Vietnamese exports. Tracking the logistics performances of the actors in the supply chain allows the development of innovative strategies. Griffis et al. (2004) developed a model to measure the effect of logistics performances on the overall performance of the supply chain. It has been asserted that increasing the logistics efficiency and productivity of enterprises positively affects the overall supply chain performance.

Innovation Performance

Innovation is a complex process involving technological invention and commercialization, and its realization requires complementary technologies and knowledge (Boxu et al. 2022). Innovation performance is defined as a multifaceted structure that shows the frequency, speed, and number of new products offered by a business to national or international markets (Zeng et al. 2010).

Accessing, sharing, and applying new information throughout the supply chain strengthens the memory of businesses. It also accelerates the development of new products and processes at lower costs (Nguyen & Harrison, 2019). Also, Gunday et al. (2011) categorized product innovation, process innovation, and management innovation. The involvement of suppliers in processes facilitates the entry of new products to international markets and improves product and service quality. Being a business partner of the supplier offers businesses the chance to follow technological developments closely and adapt as soon as possible. These developments lead to a decrease in research and development costs, and the innovation performance of enterprises increases significantly (Greco et al. 2015). The criteria of innovation performance were evaluated under innovation rate, sales performance, and sales growth rates (Yam et al. 2004).

Sandven and Smith (2000) emphasized that although enterprises focused on innovation have made great progress in sales, employment, and productivity, the same growth cannot be achieved in profit maximization. Löfsten (2014) highlighted the interaction of product innovation is not affected by the size of the business and the product life cycles, especially

patents, copyrights, and licenses have a positive effect on the sales of the business. Freel and Robson (2004) concluded that new process innovation in manufacturing companies negatively affects growth in sales.

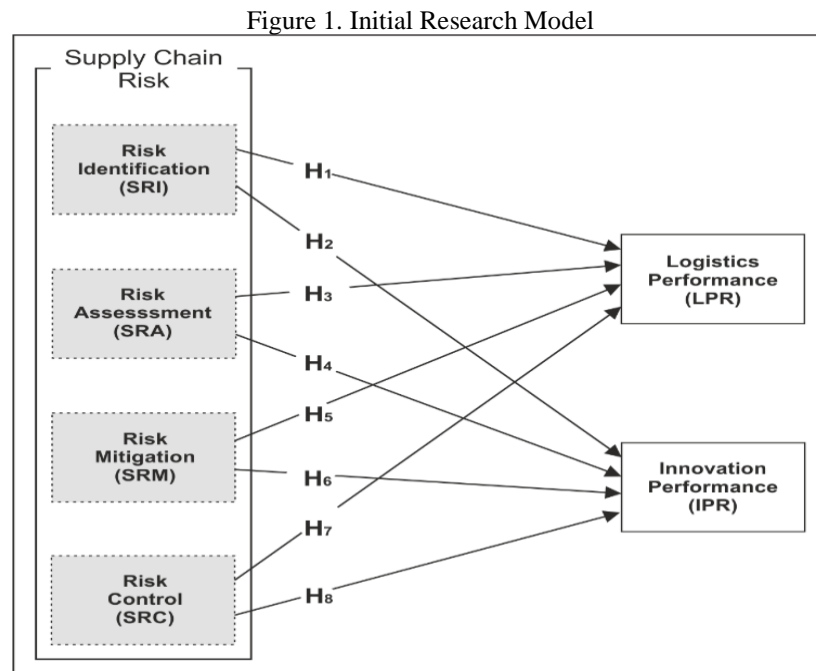
On the other hand, If the innovative technologies internalized by the business are unique and valuable, it becomes difficult to imitate their competitors. Thus, the business gains a competitive advantage and increases its market share (Buenechea-Elberdin et al. 2018). New product development capability and effectiveness are closely related to innovation performance. The increase in product innovation provides an opportunity to accelerate sales and reach new markets (Lau & Lo, 2015).

Alegre et al. (2006) proposed a model that allows product innovation performance to be measured under the factors of efficacy and efficiency. Prajogo and Ahmed, (2006) researched to measure the innovation performance of 194 managers in Australian businesses. As a result of the research, they proved that there is a strong relationship between innovation capacity and innovation performance. Prajogo and Sohal (2004) stated that according to empirical data collected from 194 middle and senior managers in Australian companies, the total quality management approach is closely related to innovation performance.

Ebersberger, et al. (2012) explained that open innovation practices have a positive effect on innovation performance in Austria, Belgium, Denmark, and Norway and internal investments strengthen innovation performance. Vijayakumar and Chandrasekar (2022) focused on a model based on innovation capability and commercial capabilities Which affect firm performance especially small and middle enterprises in India. Baqleh and Alateeqb(2023) found that big data technology does not improve supply chain performance due to a lack of understanding in Jordanian manufacturing firms. Alghababsheh and Gallear (2020) draw attention to the fact that although social capital increases the ability to exchange information, it poses a threat to supply chain risk management.

METHODOLOGY

In this study, the effects of the dimensions of supply chain risk on logistics performance and innovation performance. The theoretical background of these concepts was reviewed and an initial research model was formed as seen in Figure 1.



Source: Prepared by the Authors (2023)

H1: Risk Identification (SRI) has a positive impact on Logistics Performance (LPR)

Risk identification aims to discover the risks in the supply chain and to proactively manage the risk factors that may occur in the future. In addition, it provides information on taking protective measures. Because identifying a risk may trigger another risk management activity (Kern et al. 2012). Therefore, supply chain risk identification allows for the reduction of uncertainties and increases operational efficiency. Uncertainties in the supply chain negatively affect logistics performance (Simangunsong et al. 2012). Sellidin and Olhager (2007) proved that there is a direct relationship between logistics performance sub-criteria "delivery safety, speed of delivery" and quality, cost, and profitability in a Swedish manufacturing company.

H2: Risk Identification (SRI) has a positive impact on Innovation Performance (IPR)

Supply chain risk identification has been identified as the first step in supply chain risk management. Supply, demand, and innovation uncertainty in the supply chain are closely related to supply chain strategies (Sabri, 2019). A high supply chain fit and reduction of risk uncertainty allow for improved innovation performance. Hallavo, (2015) evaluated a strong relationship between demand uncertainty and technological uncertainty in 875 manufacturing companies in Russia. Zhang et al. (2015) present ensuring cooperation and creating synergy among the actors in the supply chain helps to enhance innovation performance.

H3: Risk Assessment (SRA) has a positive impact on Logistics Performance (LPR)

Risk assessment provides a general analysis of which factors increase or decrease the risk in the supply chain (Gaudenzi & Borghesi, 2006). Damages, losses, and delays detected in the supply chain during the risk assessment process cause a decrease in logistics performance (Sanchez-Rodrigues et al. 2010). Li and O'Brien (2001) found that lead times and speed of delivery are important factors in assessing supply chain risk management.

H4: Risk Assessment (SRA) has a positive impact on Innovation Performance (IPR)

Risk assessment is a second step in the supply chain risk process that considers the likelihood and consequences of the risk occurring (Harland et al. 2003). Both tangible and intangible factors should be considered in risk assessments. So it can lead to intangible losses such as loss of reputation, status, authority, and loss of trust (Roehrich et al. 2014). To survive in international markets where competition is intense, businesses need to innovate. Enterprises have the chance to be one step ahead of their competitors which analyze the risks in the supply chain well and turn to innovation in this direction (Sheng, 2017; Perez-de-Lema et al. 2019).

H5: Risk Mitigation (SRM) has a positive impact on Logistics Performance (LPR)

The existence of solution-oriented communication in the supply chain enables the determination of logistics problems in advance and the supply chain turns into a simpler and more understandable structure. (Vieira et al. 2015). Furthermore, developing effective cooperation with partners in the supply chain allows for improved risk mitigation in logistics activities and at the same time improves logistics performance (Norrman & Jansson 2004).

H6: Risk Mitigation (SRM) has a positive impact on Innovation Performance (IPR)

Effective risk mitigation of the supply chain increases the drive toward innovation, accelerates the implementation of joining a common plan, and reduces resistance to value innovation (Kim & Mauborgne, 2004). Before deciding on a risk mitigation strategy, businesses should carefully examine their options for acceptance, avoidance, sharing, and transfer (Fan & Stevenson, 2017). With simultaneous information sharing between businesses, new ideas and processes can be formed. Thus, corporate innovation performance can be further enhanced (Estrada et al. 2016). Jüttner and Maklan (2011) stated that innovation is a critical success factor in the relationship between supply chain risks and supply chain risk management.

H7: Risk Control (SRC) has a positive impact on Logistics Performance (LPR)

Supply chain risk control gains functions by ensuring risk awareness of employees and systematic processes (El-Baz & Ruel, 2021). Strategic collaborations in the supply chain are an effective factor in the development of logistics performance. Formalizing strategic alliances in

the supply chain removes uncertainty and significantly reduces supply chain risks. Thus, businesses have the chance to increase their logistics performance by effectively controlling risk in the supply chain (Daugherty et al. 2006). Supply chain risk control enables to improvement of information sharing, reduces costs, and reduces costs (Prajogo & Olhager, 2012). Moreover, it enhances flexibility, real-time forecasting, and, logistics planning (Nyaga et al. 2010). Supply chain risk control has positive effects on logistics performance regarding the fill rate, order cycle, lead time, on-time delivery rates, and order accuracy rates (Fawcett et al. 2012).

H8: Risk Control (SRC) has a positive impact on Innovation Performance (IPR)

Supply chain risk control encourages explicit and implicit information sharing, develops communication and coordination skills, and reduces purchasing costs (Corsten & Felde, 2005). Thus, risk control leads to the improvement of innovation performance (Cabrilo et al. 2018). The productivity and profit growth of innovative firms are higher than non-innovative firms (Cainelli et al. 2004). In the framework of supply chain risk control management, enterprises that measure innovation ability are more likely to engage in innovation activities.

Research Methods

The scales were obtained directly from former studies. Since it is a particularly beneficial tool for analyzing extremely complicated models with multiple variables and for spotting indirect and direct impacts among the variables, the structural equation modeling approach was chosen. To establish the convergent validity, confirmatory factor analyses were first carried out. To appraise the scales' reliability and discriminant validity, respectively, composite reliability and AVE values were computed. AMOS which is a statistics program for the structural equation modeling method was used to evaluate the assumptions. This method was employed in the theoretical model to comprehend the direct and indirect consequences (Civelek, 2018). The theoretical model's hypotheses have been evaluated by utilizing structural equation modeling multivariate statistical technique (Meydan & Şen, 2011). This method has been chosen to reduce measuring mistakes (Byrne, 2010). The analyses were carried out using the statistical software SPSS and AMOS.

Measures and Sampling

The scales used to measure the constructs in the research's base model were borrowed from previously published works. Five-point Likert scale with the options of strongly

disagreeing or strongly accepting was utilized. 242 genuine surveys in Turkey were obtained after more than 400 were distributed. The supply Chain Risk Management scale was developed by El Baz and Ruel, (2021) with 16 questions was used. The logistics Performance scale was developed by Bakan and Şekkel, (2016), and the Innovation Performance scale was developed by Calantone, et al. (2002) were used.

Four industry executives and three academic staff members in the field of technological innovation were consulted to enhance the survey instrument to guarantee a high level of content validity. The pre-test was then conducted conveniently. They were asked to respond to the questionnaire and provide feedback on the items' appropriateness and clarity. The reliability of the scales was examined using straightforward statistical techniques. Items' readability was verified. For these reasons, manufacturers from the investigated region's food, textile, automotive, and electronics industries were chosen as the sample. These sectors served as a good representation of the study's interests. More than other industries, the manufacturers in these had created a wide range of sophisticated, complex items for which they actively engaged in technological and manufacturing innovation. Second, these sectors made up more than 60% of the region's overall manufacturing exports in terms of value. The sampled companies were chosen if they have operations and production facilities in Turkey. The general manager, logistics manager, purchase manager, quality manager, and sales manager of a company were the respondents who were specifically targeted.

RESULTS

Construct Validity and Reliability

Before using confirmatory factor analysis (CFA), exploratory factor analysis (EFA) was used. EFA is used to clean up the data (Anderson & Gerbing, 1988). After exploratory factor analysis, 28 components were still present. Then, by using CFA, convergent validity was established. The CFA's fit indices values (i.e., $\chi^2/DF= 1.939$, $CFI=0.933$, $IFI=0.934$, $RMSEA= 0.062$) were deemed adequate (Civelek, 2018). The factor loads in the CFA Results are shown in Table 1. As can be seen in Table 2, average extracted variance values were close to or greater than the threshold (i.e. 0.5). (Byrne, 2010).

These findings demonstrated the constructs' convergent validity. The square roots of AVE values for each variable were calculated to determine discriminant validity. The diagonals in Table 2 show the AVE values' square roots. The correlation values in the same column are all less than the square roots of the AVE values. This implies that the validity of the discriminant

is established (Civelek, 2018). Each structure's reliability was independently evaluated. Composite reliability and Cronbach α scores are close to or higher than the suggested cut-off criterion of 0.7. (Fornell & Larcker, 1981).

Table 1. Confirmatory Factor Analysis Results

Variables	Obsevation	Standardized Loads	Unstandardized Loads
Risk Identification (SRI)	SRI0202	0.662	1
	SRI0404	0.791	1.033
	SRI0303	0.793	1.039
	SRI0101	0.696	0.985
Risk Assessment (SRA)	SRA0206	0.891	1
	SRA0408	0.767	0.971
	SRA0509	0.721	0.937
	SRA0105	0.867	1.039
	SRA0307	0.876	1.039
Risk Mitigation (SRM)	SRM0110	0.810	1
	SRM0211	0.864	1.108
Risk Control (SRC)	SRC0113	0.612	1
	SRC0214	0.751	1.201
	SRC0315	0.912	1.464
	SRC0416	0.937	1.497
Logistics Performance (LPR)	LPR1430	0.692	1
	LPR0925	0.782	1.202
	LPR0521	0.701	1.291
	LPR1329	0.661	1.257
	LPR0117	0.794	1.266
	LPR0622	0.751	1.245
	LPR0420	0.826	1.282
	LPR0319	0.843	1.386
Innovation Performance (IPR)	IPR0434	0.711	1
	IPR0333	0.757	0.980
	IPR0131	0.817	0.983
	IPR0232	0.821	1.047
	IPR0636	0.614	0.762

p<0.01 for all items

Source: Prepared by the Authors (2023)

Table 2 lists descriptive statistics of the dimensions, Cronbach's alpha and composite reliability coefficients, average extracted values for variance, and Pearson correlations among all dimensions.

Table 2. Construct Reliabilities, Descriptives, and Correlations

Variables	1	2	3	4	5	6
1. Risk Identification	(0.738)					
2. Risk Assessment	0.745*	(0.827)				
3. Risk Mitigation	0.633*	0.779*	(0.837)			
4. Risk Control	0.608*	0.654*	0.595*	(0.814)		
5. Logistics Performance	0.468*	0.534*	0.430*	0.574*	(0.759)	
6. Innovation Performance	0.460*	0.460*	0.455*	0.533*	0.519*	(0.748)
Composite reliability	0.826	0.915	0.824	0.884	0.915	0.863

Average variance ext.	0.576	0.559	0.544	0.684	0.701	0.662
Cronbach α	0.822	0.916	0.823	0.887	0.912	0.858

*p < 0.05

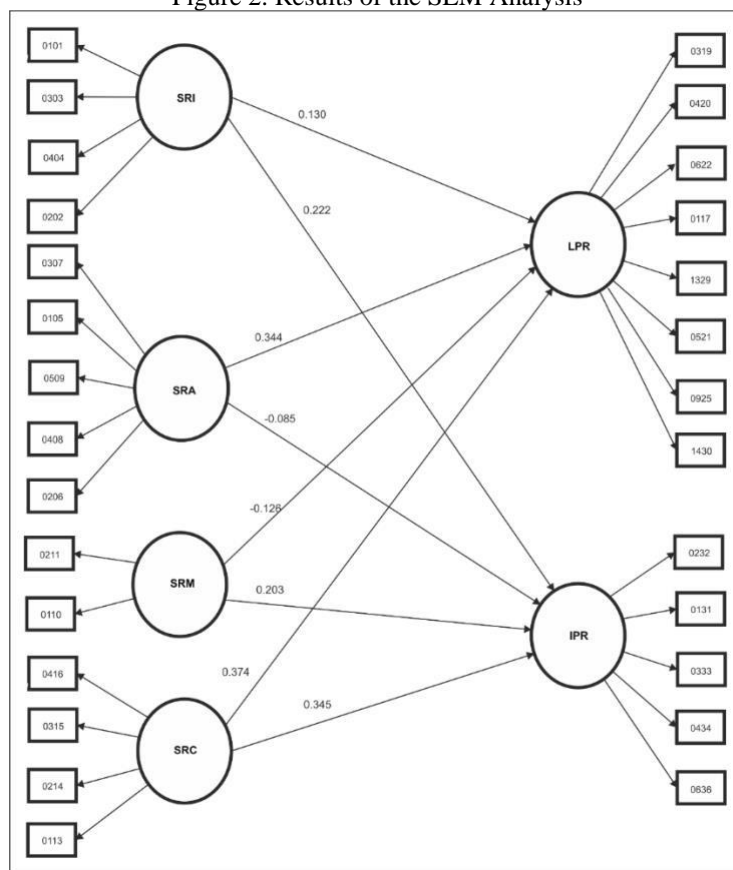
Note: Values in diagonals are the square root of AVEs

Source: Prepared by the Authors (2023)

Test of the Hypotheses

To examine the hypotheses that are created by referencing the underlying theories in the literature, the structural equation modeling method was conducted. The fit of the structural model was appraised according to the goodness of fit indices. Fit indices values of the structural model reached a satisfactory level (i.e. $\chi^2/DF = 1.988$, CFI = 0.930, IFI = 0.930, RMSEA= 0.064) (Civelek, 2018).

Figure 2. Results of the SEM Analysis



Note: $\chi^2/DF = 1.988$, CFI = 0.930, IFI = 0.930, RMSEA= 0.064

Source: Prepared by the Authors (2023)

Table 3. Hypotheses Test Results

Relationships	Standardized	Unstandardized	Hypotheses	Results
	Coefficients	Coefficients		
SRI → LPR	0.130	0.107	H ₁	Not Supported
SRI → IPR	0.222	0.277	H ₂	Not Supported
SRA → LPR	0.344	0.284	H ₃	Not Supported
SRA → IPR	-0.085	-0.107	H ₄	Not Supported
SRM → LPR	-0.126	-0.100	H ₅	Not Supported
SRM → IPR	0.203	0.244	H ₆	Not Supported
SRC → LPR	0.374*	0.344	H ₇	Supported
SRC → IPR	0.345*	0.482	H ₈	Supported

*p < 0.05

Source: Prepared by the Authors (2023)

The H1 hypothesis is rejected. This implies Risk Identification (SRI) has no impact on Logistics Performance (LPR). The H2 hypothesis is rejected. This implies Risk Identification (SRI) has no impact on Innovation Performance (IPR). The H3 hypothesis is rejected. This implies Risk Assessment (SRA) has no impact on Logistics Performance (LPR). The H4 hypothesis is rejected. This implies Risk Assessment (SRA) has no impact on Innovation Performance (IPR). The H5 hypothesis is rejected. This implies Risk Mitigation (SRM) has no impact on Logistics Performance (LPR). The H6 hypothesis is rejected. This implies Risk Mitigation (SRM) has no impact on Innovation Performance (IPR). The H7 hypothesis is supported. This implies Risk Control (SRC) has a direct effect on Logistics Performance (LPR). The H8 hypothesis is supported. This implies Risk Control (SRC) has a direct effect on Innovation Performance (IPR).

CONCLUSION

In the 21st century, businesses are struggling to survive in a more competitive and uncertain environment, and they are faced with changing consumer expectations and constant innovation pressure. The rapid increase and constant variation in supply and demand in the markets make supply chains more complex. Therefore, intense competition between businesses is also experienced in supply chain risks Which occur in the supply chain and cause delivery delays, economic losses, and customer losses. As a result, supply chain risk management plays a key role in increasing business performance and gaining competitive advantage.

Our research contributes to a better understanding of supply chain risks, the interrelationships among their dimensions, and their impact on innovation performance and logistics performance for manufacturing enterprises in many sectors. Moreover, it is one of the first studies to consider supply chain risks and investigate logistics and innovation performance,

providing the theoretical underpinning for furthering the literature. Research findings show that risk mitigation which is one of the sub-dimensions of supply chain risks positively affects logistics performance. Further results in this study indicate that although the multidimensionality of supply chain risks has been verified, no evidence has been found that risk identification and risk assessment affect innovation performance and logistics performance.

Despite that, it has been concluded that risk control is effective in increasing both logistics performance and innovation performance. These findings provide both theoretical and practitioner insights. The results of the study correspond closely with the theoretical assumptions and generally confirm the results from previous research which were discussed in the literature review. Wang (2018) presented empirical evidence that supply chain risks negatively affect logistics performance in Australia. Simangunsong et al. (2012) argued that supply chain risk identification and developing strategies to reduce risks contribute to the improvement of the overall efficiency of logistics performance.

Firstly, businesses need to identify supply chain risk management. Secondly, choosing the right partners in the supply chain and effective information sharing play a key role in reducing risks. Relations in the supply chain should be based on trust and mutual respect. Developing cooperation in the supply chain decreases disruptions in the supply chain and also allows for improved product and customer service quality. It also helps achieve the goal of creating value in the supply chain.

Effective sharing of resources along the entire supply chain should be encouraged and partnerships should be strengthened to reduce risks in the supply chain. Active participation of enterprises in joint decision-making processes and effective information sharing will lead to a further increase in innovation performance. As a result, it is recommended that businesses allocate resources to research and development to reduce supply chain risks and share these expenses with their partners in the supply chain.

Although the study makes significant contributions to the literature on supply chain risks and guides industry representatives in practice, it has some limitations. The first limitation, the sample of the research consists of businesses in the electronics, automotive, food, and textile sectors. The second limitation is that the study was conducted in only 30 medium and large enterprises in Turkey. In future studies, it will be beneficial to develop studies in different countries and different sectors. It will be more interesting if the health and logistics sectors are included in the sample. In addition, it would be more appropriate to consider other actors in the

supply chain (wholesalers, distributors, retailers, freight forwarders). Also, it is planned to add the innovation capability variable of the enterprises to the model.

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