

The Role of Information Technology in the Effect of Innovation Capability on Logistics Service Quality

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ABSTRACT

Purpose – In the current intense competitive environment, companies continuously need to increase their performance and adapt their activities to the developing and changing environment in order to survive. The concepts of quality, technology and innovation are among the most prominent issues in this competitive environment. At this point, information technologies integrated into the business, innovation activities and logistics services that develop along with these activities are important issues that have been recently emphasized. Accordingly, this study aims to reveal the role of information technology use in supply chain innovation and logistics service quality.

Design/Methodology/Approach - More than 326 questionnaires were distributed to Turkey's leading logistics companies and companies with logistics departments. The companies operating in logistics sector and the employees working in the logistics departments of companies operating in the production and service sector constitute the sample of the study. 144 valid questionnaires were reached. 80% of the respondents are mid-level and 20% are senior managers. The data obtained by the survey method were analyzed using the structural equation model.

Findings – According to the results, it has been determined that information technologies have a mediator effect between innovation capability in the supply chain and logistics service quality.

Discussion – Findings obtained at the end of the research are consistent with the other studies in the literature. This research has important managerial implications. The results of this research have revealed the role of information technologies in the efficient use of innovation capacity for companies operating in logistics sector. Information technologies play a key role in the relationship between innovation and logistics service quality.

1. INTRODUCTION

In today's trade world, which has become a single market with the disappearance of borders, the basic criterion for companies to gain an advantage over their competitors is customer satisfaction. Companies that meet customer demands on time and with the highest level of satisfaction can gain a competitive advantage. In order to achieve this, companies must constantly increase their performance and keep up with development.

The degree to which an enterprise can use its assets with minimum cost and maximum efficiency determines the "capability" of the enterprise. In order for the business capability to provide competitive power, it must be valuable, high quality and non-imitative. In order for the relevant basic talent to be sustainable, it must be compatible with constantly changing conditions along with both internal and external environment (Barney et. al., 1995).

Logistics has become one of the most important parts of the service sector with its impact on and contribution to every stage of production. In recent years, the supply chain has become quite complex with the increase in international trade, significant developments in technology and the differentiation of customer requests as a result. This has forced the companies to make innovations in processes and improve the quality of the service provided by developing new applications and strategies (Beamon, 1999). Logistics service quality is one of the important factors to ensure customer satisfaction and strengthen the competitive position of companies. It has become a necessity to provide innovative solutions in order to respond to changing conditions and customer expectations quickly and accurately and to provide quality service in logistics (Gulc, 2017). There are generally

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technological innovations in logistics sector. Innovations and developments in information and communication technologies enable companies to increase their service quality and offer the most accurate solutions in response to customer demands (Eriř, 2008).

Today, businesses are in the race to improve themselves in order to gain superiority against their competitors in the global competitive environment. Therefore, they are trying to develop their innovative abilities to be faster and more flexible in order to meet the expectations of the market (Gunasekaran and Ngai, 2004). Today's society continues its existence as an information society. Supply chain members that want to increase customer satisfaction in the information society need information technologies to make innovative applications. The innovativeness of the chain members makes their use of technology compulsory. Businesses can continue their activities by overcoming time differences and distances thanks to information technologies (Akin, 1998). Therefore, the understanding of innovation pushes businesses to use information technologies.

In the current market, when a company confronts an innovative competitor, it may try to engage in an innovative attitude reflexively in order to compete, maintain or even increase its market share. Therefore, it may consider integrating information technologies into its processes, technological development and differentiation (Bommer and Jalajas, 2002). The necessity of being innovative in order to compete by adapting to the times will push the company to use information technologies. Or it will be inevitable for the other members of the chain to integrate with this technology in order for the information technologies owned by one of the chain members to benefit throughout the service offered. Therefore, the information technology spreads throughout the chain.

Quality is also a critical determinant of competitiveness in all areas of production and service. It is a differentiator that allows organizations to differentiate from their competitors and become preferred. As in all services, quality has a very important place in logistics service. The reason for this is that logistics plays a role in strategic decisions that will affect long-term performance, and it is one of the main sources of customer satisfaction with the ability to directly affect profit and overall organizational performance (Waters, 2003). Logistics service quality is the result obtained by comparing the service buyer's expectations from the service provider in logistics services and the perception resulting from the service. For this reason, it is very important for a quality in logistics service to fully understand the expectations of the buyer and perform accordingly (Campos and No'brega, 2009). With the understanding of the importance of logistics activities in business success and the realization of their effects on the overall performance of the company, the importance given to logistics services and the tendencies of specialization in this field have increased day by day.

Information technologies have enabled companies to make better decisions, improve their processes, and thus produce higher quality products and services. They have also improved firms' ability to collect, analyze and share information. They further have ensured that all processes to be faster and more error-free. In the dynamic and competitive market we are in, it has become an inevitable obligation for companies to obtain information quickly and accurately, interpret it and make the fastest and most correct decision possible as a result of the data obtained in order to continue their existence. Logistics is one of the most important links of the supply chain. Logistics service quality also emerges as a strategically important concept that enables differentiation among suppliers (Gotzamani et.al., 2010). Increasing the service quality in logistics is one of the issues that has recently been emphasized due to its strategic importance. One of the most important criteria in order to increase the quality of logistics service, to adapt the services to time and environment, and to bring profit accordingly, is the adoption of the understanding of innovation and innovativeness.

Meeting customer demands effectively depends on the speed and flexibility of logistics systems (Wisner, 2003). It is information and communication technologies that provide speed, flexibility and efficiency to logistics systems. Developments in information and communication technologies have had a positive effect on speed, efficiency, flexibility and, consequently, on the field of service quality (Papazoglou and Tsalgatidou, 2000). The use of information technologies enables more efficient and faster flow of products, information and money among supply chain members, increasing the quality of production and service processes (Dong et. al., 2009).

Many of the developments occurring in the logistics sector are due to the improvement effect of information technology development, use and performance (Bowersox and Daugherty, 1995). With the increase of trade, more information, material and service flow is needed, and all processes have become more complex. Technological developments have solved this complexity, providing better quality of logistics service and increasing the quality (Demir, 2013). However, with the increasing trade and competition, companies have started to have reservations about responding to customer demands in the fastest and most accurate way. Firms are faced with the necessity of making technology investments in order to adapt to the developments. However, this brings about serious costs with it. In this direction, companies have turned to outsourcing in order to avoid large investments that cause serious costs and to increase the quality of their activities. Today, many companies find that the logistics activities are carried out by third party logistics companies with higher quality and lower cost (Dougherty et. al., 1996). Accordingly, this study aims to demonstrate the role of information technology use in supply chain innovation and logistics service quality.

2. BACKGROUND

Looking at the development of societies, it will be clearly seen that there is a continuous transformation with time. The main reason for this transformation has been the innovations and innovative understanding. Schumpeter defined the word "innovation" as the economic driver of the competitiveness of the firm. While Schumpeter first defined innovation as the creative destruction process that supports economic development, then he expressed it as an accumulation of creativity that provides growth and development for the company and offers a competitive advantage with inimitable knowledge in technological fields. (Schumpeter, 1942)

Innovativeness in the dictionary is defined as "the state of being innovative"(Turkish Language Association Dictionaries). Hurley and Hult (1998) defined innovation for firms as being open to new ideas and making it a part of the company structure. Innovation is an evolutionary process for firms and can find its existence as a new product, a new service, a new system and a new policy. From an innovative business approach, innovation should be perceived not as a one-off activity, but as one that will continue continuously throughout the existence of the company (Damanpour, 1987).

Increasing trade with globalization has led to the dynamization of the market structure and uncertainties in consumer demands. Consumers now have more information, choice and, accordingly, dominance. This has made it necessary for companies to adapt to the developing environment and offer innovative applications, products and services that will be the reasons for preference. Otherwise, it will not be possible for companies to survive in an intensely competitive environment (Butz and Goodstein, 1996).

Christopher (1993) was the first author to describe logistics innovation as a competitive strategy, a reference for logistics innovation. Logistics innovation is new applications and processes on delivery and related activities (Gao et.al., 2017). Innovation enables companies to increase the quality of products and services, compete in global markets and minimize costs (Uzun, 2001). With the increasing need of societies for service activities, the issue of innovation has become one of the most important issues in service sector (Toivonen andTuominen, 2009).

Many studies about the effects of innovation on firm performance have been conducted from past to present. The first of these studies is the study by Schumpeter (1934), where he stated that the newly launched products directly entered the market, which provided companies with high profits. According to the study, although profit rates decrease day by day due to competition, the profitability of companies that maintain their innovation and continue to offer innovative products to the market will also be permanent.

Jiménez-Jimenez et al. (2008) aimed to determine the relationship between market orientation, organizational learning, innovativeness and performance. According to the results obtained, it was determined that firms should adopt the innovation approach for performance increases, and innovation mediates the relationship between market orientation, organizational learning and firm performance. Afuah (2009) argued that the reasons for companies to adopt the innovation approach are their desire to increase their competitiveness in the market, their growth and financial development expectations. In the study conducted by Bigliardi (2013), it was concluded that the innovation levels of small and medium enterprises (SMEs) have an increasing effect on their financial performance.

Nowadays, not only manufacturing companies but also service companies have started to see quality service as a must for success. In the world-wide market and under conditions marked by increasing competition ~~with~~ each passing day, increasing the service quality by providing customer-oriented service with the priority of customer satisfaction are also the main goals of service businesses. Since all logistics activities are services, all logistics processes should be evaluated in the light of service quality. Logistics service quality has an ever-increasing importance due to its ability to directly affect customer satisfaction, thus profit and the performance of the entire organization (Waters, 2003).

The measurement of service quality in logistics service is easier than in service sectors where perception is more relative. The best example to be given for the sectors where the relative perception is higher will be personal care services. Here, the understanding of quality may vary greatly from person to person. However, due to the structure of the logistics service, it is more related to the perception of time, place, undamagedness and reliability of the transported product. And as long as these factors are properly provided, satisfaction in the service is likely to be achieved. However, of course, these perceptions are not the only determinants of the logistics service quality. Many different perception factors such as the relations between the business and the consumer, the different expectations of the consumer, the exchange of information, correct communication and accessibility will come into play that will affect the quality of logistics services.

Yang et al. (2009) argued that logistics service capability has a positive effect on firm performance. Another study conducted by Azevedo et al. (2007) investigated the effect of logistics activities on business performance in industrial enterprises. Stock control, handling, packaging, picking and storage are the logistics activities that are examined on a study basis. According to the results, it was observed that the processes and practices developed within the scope of logistics activities had an impact on the business performance, primarily on costs. It is concluded that inventory control is also a highly influential factor on business performance. Additionally, Aslan et al. (2018) argued that the quality of logistics service significantly affects logistics and firm performance in a positive direction.

With the realization of the importance of service quality in the field of logistics, factors affecting the service quality have started to be investigated (Zakaria et.al. ,2010). Mentzer et al. (1999) adapted the service quality models created by Parasuraman et al. (1985) and Grönroos (1984) to the field of logistics. As a result of that study, they determined the quality of information, order procedure, order delivery quantity, timing, order accuracy, order quality, order status, incorrect order processing and personnel connection quality as the dimensions of logistics service quality. Nowadays, it has become a necessity to make use of information technologies in order to realize each of these dimensions in the most effective, correct and fastest way. Otherwise, it will be inevitable to fall behind in the competition and even disappear from the market due to not being able to keep up with the quality and speed of companies using information technologies.

Information technologies constitute the basis of today's information economy by providing speed and gain by overcoming the difficulties encountered in traditional systems (Ollo-López & Aramendía-Muneta, 2012). Information technology resources owned by companies can be shown as a source of competitive power for companies in the long run (Keen, 1993). Even today, many companies cannot continue their activities without technology and computer systems. A significant number of companies relies on and need information technologies in order to maintain their activities and competitive advantages (Barnatt, 1996). In other words, information technologies emerge as one of the most important competitive weapons in the current dynamic competitive environment (Porter, 1985).

Information technologies are preferred by companies in order to gain a competitive advantage over their competitors, improve business methods and make them efficient, provide new business areas and increase performance as a result of all these developments (Peppard, 1993). Information technologies provide companies with time and efficiency. They also enable fast and accurate acquisition of information and its transfer between necessary resources, enabling efficient and low-cost procurement practices in the supply chain and ensuring the integration of the entire process (Bharadwaj, 2000). Companies can reduce unnecessary activities and increase their quality standards thanks to the information technologies they use. In this way, they gain the ability to respond to customer demands and expectations in a faster and more accurate manner (Han et.al., 2009).

Various studies have been conducted to investigate the effects of information technologies on firm performance, but there are not enough studies showing that there are strong connections between them. The uncertainty in detecting this link is known as the "efficiency paradox". According to the efficiency paradox, information technologies do not affect performance positively for every company and for all times. This is a phenomenon that can change depending on the situation and time (Silva, 2001).

Porter and Millar (1985) stated that information technologies lead companies to new areas that will provide a competitive advantage and companies can gain a distinctive advantage with new opportunities. Lau and Tokutsu (1992) investigated the effects of information technology investments on America's economic growth between 1960 and 1990. During this period, they reached the conclusion that half of the economic growth in America was achieved through the information technology investments. Gray et. al. (2000) concluded that there is a positive relationship between the use of information technology, organizational characteristics and firm performance in their studies. According to the study, as companies adopt a customer-oriented approach, they attach more importance to innovation activities as well as development, and these developments, in turn, affect the performance of the company positively.

Bresnahan et. al. (2002) stated in his study that using information technologies and human resources simultaneously and in an integrated structure will result in an improvement in firm performance. Matolcsy et al. (2005) investigated the economic benefits of using information technology and found that information technology applications provide economic contribution to companies. Jin-bo et al. (2006) argued that advanced information and production technologies will produce positive results for companies in the areas of operational performance, organizational and managerial performance. Savitskie (2007) concluded that the use of information technology in logistics has a positive effect on overall firm performance in the field of logistics. Manochehri et.al. (2012) argued that the use of information technology has many benefits such as providing more advantages for companies, efficiency and ease of financial transaction and overcoming commercial problems. DeGroot and Marx (2013) stated that information technologies reduce costs and, accordingly, increase agility by improving the ability to return to consumer demands faster and with a higher quality, which has a positive effect on the overall firm performance. Kearns and Lederer (2003), Santhanam and Hartono (2003) and Bharadwaj (2000) have argued that information technologies have a direct impact on the financial performance of companies.

3. HYPOTHESIS DEVELOPMENT

3.1. Innovation Capability positively affects Information Technology

Porter (1991) stated that companies gain a competitive advantage through innovation. The author described innovations as new technologies and new ways of doing business. Lumpkin and Gregory (1996) stated that innovation consists of new ideas, experiences and creative processes that can result in new products, services and technologies. Galanakis (2001) stated that innovation and creativity are identified with each other, and innovative applications include developing new products, services, and ideas by using information technologies. Babacan and Onat (2002) argued that innovativeness and creativity changed market conditions and caused new habits for consumers. They stated that information technologies are an important factor in providing innovative solutions to changing consumer demands. Hübner (2007) stated that innovation strategies guide the advancement of technology. Dodgson et al. (2008) maintained that all technological activities are managed by innovation strategies.

H₁: Innovation Capability positively affects Information Technology.

3.2. Information Technology positively affects Logistics Service Quality.

Lalonde and Master (1994) argued that the use of information technologies affects the logistics process positively. Benjamin and Wigand (1995), advocated that facilitating the cooperation between the parties in logistics operation processes, providing a better quality service by providing correct communication and information flow between the supply chain partners are among the most important effects of information technologies on logistics service quality. Closs et al. (1997) put forth that information technologies increase the overall firm performance, increase the quality of logistics service and cause a decrease in costs. Christopher (1998) argued that information technologies are a driving force for logistics strategy. Prahalad and Krishnan (1999) stated that one of the most important factors for an effective logistics service quality is information

technology systems. Founou (2002) claimed that the use of information technologies in the logistics sector increases efficiency and competitiveness. Krauth et al. (2005) investigated the performance indicators that affect the logistics service performance. Their study has shown efficiency, productivity, customer satisfaction and the ability to use information technologies as the main performance criteria. Bienstock et al. (2008) argued that one of the most important factors of effective logistics services is adequate information technology systems. They stated that the logistics operations of information technologies facilitate the cooperation of supply chain members. Han et al. (2009) argued that companies can integrate processes with information technologies, increase quality by eliminating unnecessary activities, and thus, ensure customer satisfaction. According to Tadejko (2015), logistics information systems contribute to the development of logistics activities.

H₂: Information Technology positively affects Logistics Service Quality.

H_{2a}: Information Technology positively affects Personnel Contact Quality.

H_{2b}: Information Technology positively affects Order Fulfilment Quality.

H_{2c}: Information Technology positively affects Information Quality.

H_{2a}: Information Technology positively affects Social Responsibility.

3.3. Innovation Capability positively affects Logistics Service Quality.

Zhao and Wang (2010) stated that while manufacturing companies adopt an innovative understanding in their products and processes, all members in the supply chain should adopt this understanding in order to achieve maximum efficiency. In order to benefit from the innovative application of a manufacturing enterprise at the maximum level, service businesses that provide that service to customers should also be integrated into this innovation. In this sense, the issue of innovation in the logistics sector has started to gain importance. Glenn et al. (2005) stated in their study that logistics innovation affects service quality positively. Wallenburg (2009) mentioned the importance of innovation and service difference for logistics businesses but stated that logistics companies have significant deficiencies in this regard. (Bolton et al. (2007) stated that innovative practices will improve logistics services and provide a competitive power by strengthening customer relations. Burmanoğlu (2012) stated that logistics services are a value providing element in supply chain management. Innovative developments in chain links will increase the logistics performance and service quality. Götberg and Lindberg (2016) stated that for an effective supply chain, integration and strong cooperation should be ensured among all the rings in the chain. In this way, they argued that the innovations made in the whole chain and the innovative understanding of all rings of the chain will increase the quality and effectiveness of the services offered and reduce the costs.

H₃: Innovation Capability positively affects Logistics Service Quality.

H_{3a}: Innovation Capability positively affects Personnel Contact Quality.

H_{3b}: Innovation Capability positively affects Order Fulfilment Quality.

H_{3c}: Innovation Capability positively affects Information Quality.

H_{3a}: Innovation Capability positively affects Social Responsibility.

H₄: Information Technology plays a mediator role in the relationship between Innovation Capability and Logistics Service Quality.

H_{4a}: Information Technology plays a mediator role in the relationship between Innovation Capability and Personnel Contact Quality.

H_{4b}: Information Technology plays a mediator role in the relationship between Innovation Capability and Order Fulfilment Quality.

H_{4c}: Information Technology plays a mediator role in the relationship between Innovation Capability and Information Quality.

H_{4d}: Information Technology plays a mediator role in the relationship between Innovation Capability and Social Responsibility.

The conceptual research model shown in Figure 1 aims to explore the role of information technology in the relationship between innovation capability and logistics service quality.

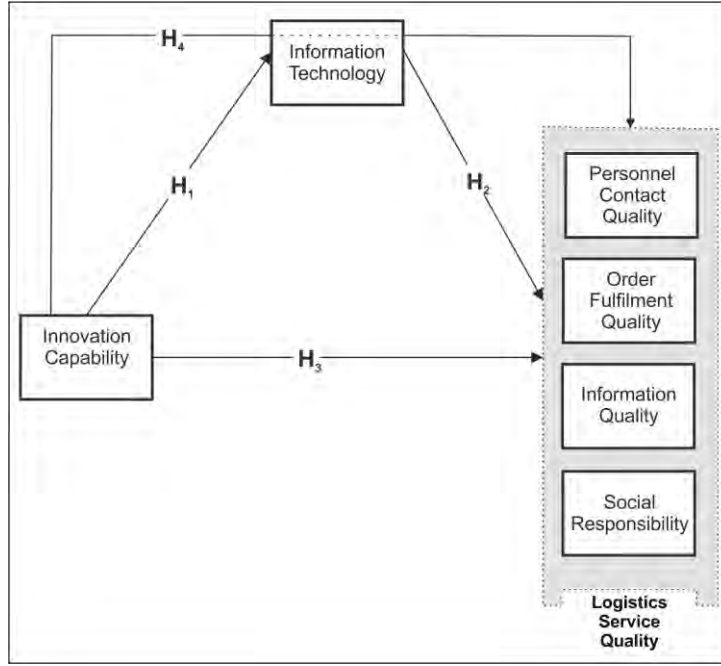


Figure 1. Conceptual Research Model

4. METHODOLOGY

In the confirmatory factor analysis, the theoretically predetermined factor structure is confirmed by the current data. In other words, in the confirmatory factor analysis, which factor will be loaded on an observed variable is predetermined. By means of the confirmatory factor analysis, previously discovered scales are confirmed again with the collected data. To test the above hypotheses in this research, the structural equation modeling method (SEM) was used to analyze the mediator role of information technology in the relationship between innovation capability and logistics service quality. SEM is a very useful method to analyze highly complex multiple variable models and to reveal direct and indirect relationships between variables. Therefore, this method has been chosen to test the research hypotheses. This is a multivariate analysis method that allows the hypothesis in the conceptual model to be tested together, and direct and indirect relationships to be measured within a single model (Meydan & Şen, 2011). Moreover, it is the method that minimizes measurement errors compared to traditional methods (Byrne, 2010) (Fornell and Larcker, 1981). AMOS and SPSS statistics programs were used for the analyses. According to Baron and Kenny method, three different models are developed to reveal the mediator variable in the relationship between independent and dependent variables. The reason for this is to decompose the expected effects between dependent, independent and mediator variables (Baron and Kenny, 1986). In the first model, the direct effect between the dependent and independent variables is measured. In the second model, the relationship between the independent variable and the mediator variable is measured. In the third model, the effects among all the variables of the conceptual model are measured simultaneously. The fit indices for all the models are taken into consideration separately. Subsequently, standardized coefficients in three different models are compared. During the comparison, it is evaluated how the significant relationship between dependent variable and independent variable changes when the mediator variable is added to the model (Civelek, 2018).

4.1 Measures and Sampling

The scales taken from the prior studies were utilized to measure the constructs. To measure Innovation Capability, the scales adopted by Panayides ve Lun (2009) were used. Similarly, the scales taken from and developed by Bienstock & Royne (2010), which were adapted to Turkish by Aslan.H., Taşçı. H., Yıldız.B. (2018) were used to measure information technology.

More than 326 having been distributed, 144 valid questionnaires were collected from different leading logistics companies in Turkey by employing convenience voluntary response sampling method. The data of the survey of the research were collected between 20.10.2019 and 22.12.2019. Employees who work at logistics

departments of the companies make up the sample subjects of the study. %80 of the respondents are middle level and %20 are top level managers.

The dimension of the firm performance was measured with the 15-question scale that Akgün et al. (2009) received from Ellinger et al. (2002) and developed in Turkey. The logistics service quality dimension was measured with a 21-question scale developed by Thai (2013).

The majority of the companies participating in the survey operate in service sector with a rate of 52%. 51% of the companies that the participants work with have more than 250 employees and 63% of them have annual sales figures amounting over 10 million TL. 80% of the respondents are employed in mid-level management positions in their companies, 67% are university graduates and 24% have a master's degree.

4.2 Construct Validity and Reliability

CFA was conducted in order to detect the convergent validity (Anderson & Gerbing, 1988, 414). The confirmatory factor analysis (CFA) was carried out for the 25 purified items following the process of the principle component analysis. CFA model fit indicators reach adequate degree: $\chi^2/DF = 1.889$, CFI=0.939, IFI=0.940, RMSEA= 0.079. CMIN is the Likelihood Ratio Chi-Square analysis and indicate the conformity between the acquired model and initial model. According to the outcomes of the CFA analysis, as presented in Table 1, the standardized loads of each item have been obtained larger than 0.5 and significant. χ^2/DF and other fit indices have been found in the acceptable levels (Civelek, 2018).

Table 1. Confirmatory Factor Analysis Results

Variables	Items	Standardized Factor Loads	Unstandardized Factor Loads
Personnel Contact Quality (PCQ)	PCQ0431	0.840	1
	PCQ0128	0.817	0.917
	PCQ0330	0.901	1.042
	PCQ0229	0.908	1.120
Order Fulfilment Quality (OFQ)	OFQ0136	0.832	1
	OFQ0439	0.813	0.896
	OFQ0237	0.833	1.037
Information Quality (INQ)	INQ0233	0.835	1
	INQ0334	0.798	0.887
	INQ0132	0.777	0.835
Social Responsibility (SCR)	SCR0246	0.799	1
	SCR0448	0.906	1.202
	SCR0347	0.948	1.230
Innovation Capability (INC)	INC0520	0.759	1
	INC0116	0.892	1.356
	INC0419	0.870	1.169
	INC0217	0.893	1.271
	INC0318	0.922	1.295
Information Technology (INT)	INT0121	0.628	1
	INT0727	0.873	1.533
	INT0222	0.813	1.377
	INT0525	0.947	1.654
	INT0626	0.936	1.551
	INT0323	0.879	1.394
	INT0424	0.952	1.723

p<0.05 for all items

The outcomes have determined the convergent validity of the scales employed in this research. For the confirmation of the discriminant validity, the AVE (Average Variance Extracted Value) has been calculated and compared to the correlation values of the constructs in the same column (Civelek, 2018). In Table 2, the values in the bracket show the square root of AVE value for each construct and are greater than the correlation values in each column. The reliability of each construct has also been tested. The composite reliability and Cronbach α values are above the threshold (i.e. 0.7) (Fornell & Larcker, 1981). Table 2 indicates composite reliabilities, Pearson correlation coefficients, average variance extracted values, Cronbach α values and descriptive statistics.

Table 2. Descriptive Statistics, Correlations and Reliability

Variables	1	2	3	4	5	6
1. Personnel Contact Quality	(0.867)					
2. Order Fulfilment Quality	0.817*	(0.825)				
3. Information Quality	0.776*	0.801*	(0.803)			
4. Social Responsibility	0.530*	0.572*	0.649*	(0.886)		
5. Innovation Capability	0.305*	0.421*	0.332*	0.212*	(0.868)	
6. Information Technology	0.703*	0.708*	0.699*	0.494*	0.387*	(0.867)
Composite reliability	0.924	0.866	0.845	0.916	0.939	0.955
Average variance ext.	0.752	0.682	0.646	0.786	0.755	0.753
Cronbach α	0.922	0.859	0.861	0.913	0.938	0.955
Mean	3.77	3.81	3.71	3.72	3.86	3.71
Standard Deviation	0.75	0.73	0.75	0.89	0.83	0.84

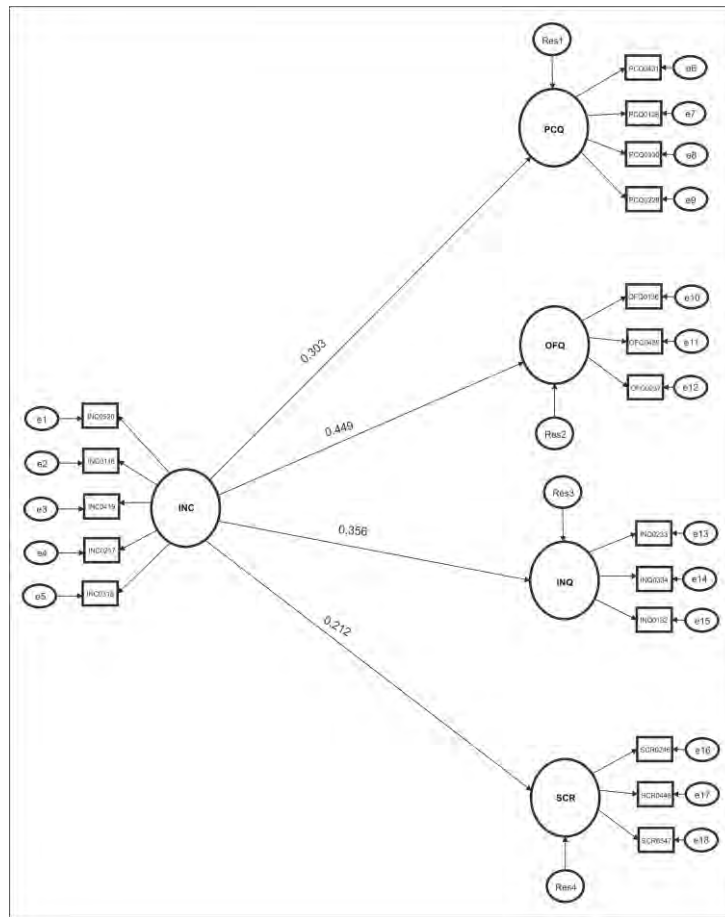
*p < 0.01

Note: Values in the bracket indicate the square root of AVEs.

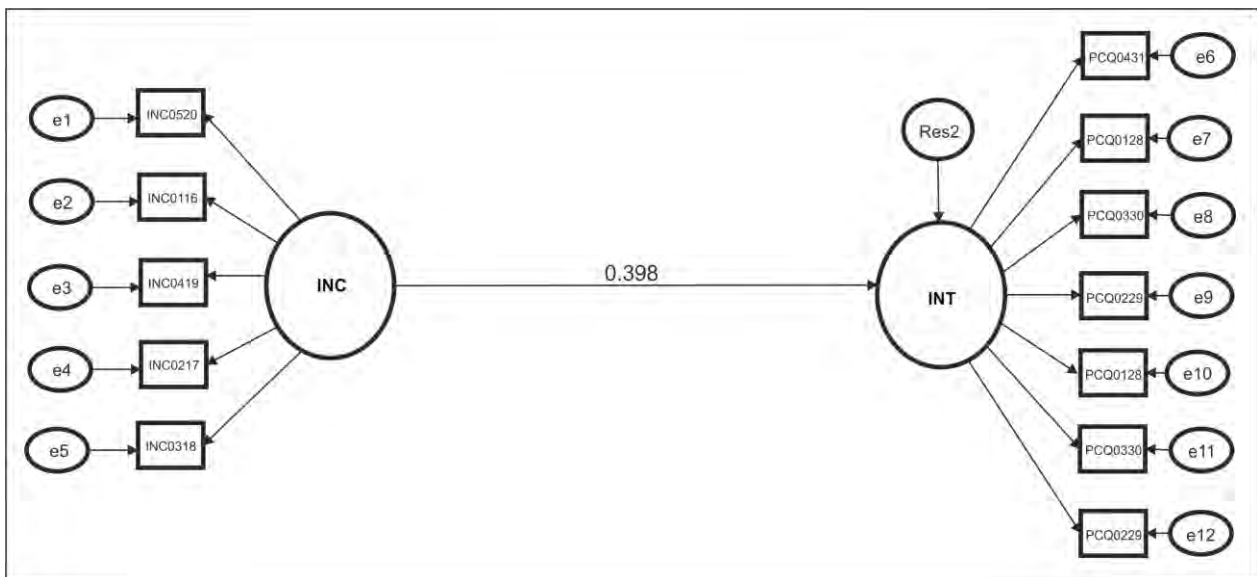
5. FINDINGS

Research hypotheses have been tested by employing Baron & Kenny method (Baron & Kenny, 1986). In order to perform this method, three models have been needed to be tested. These three models are shown in Figure 2, Figure 3 and Figure 4, respectively. The tests for each model have been conducted with CB-SEM (Covariance Based Structural Equation Modelling). Maximum likelihood estimation has been used as the default method. Absolute and relative goodness-of-fit indices of each model have been evaluated to determine the adequate model fits. The values obtained for Model 1 are as follows: χ^2/DF value is 2.003. CFI and IFI are 0.950 and 0.950, respectively. RMSEA is 0.084. For Model 2: χ^2/DF value is 1.748. CFI and IFI are 0.979. RMSEA is 0.072. For Model 3: χ^2/DF value is 1.925. CFI and IFI are 0.937 and 0.938, respectively. RMSEA is 0.080. The results are within the acceptable threshold levels (Civelek, 2018).

Baron & Kenny method initially requires that the correlation coefficients among the variables must be significant (Baron & Kenny, 1986). This is the prerequisite for the mediator variable analysis. The correlation coefficients are found significant in the analysis as shown in Table 2.



Note: $\chi^2/DF = 2.003$, CFI = 0.950, IFI = 0.951, RMSEA= 0.084
Figure 2. Results of SEM Analysis of Model 1

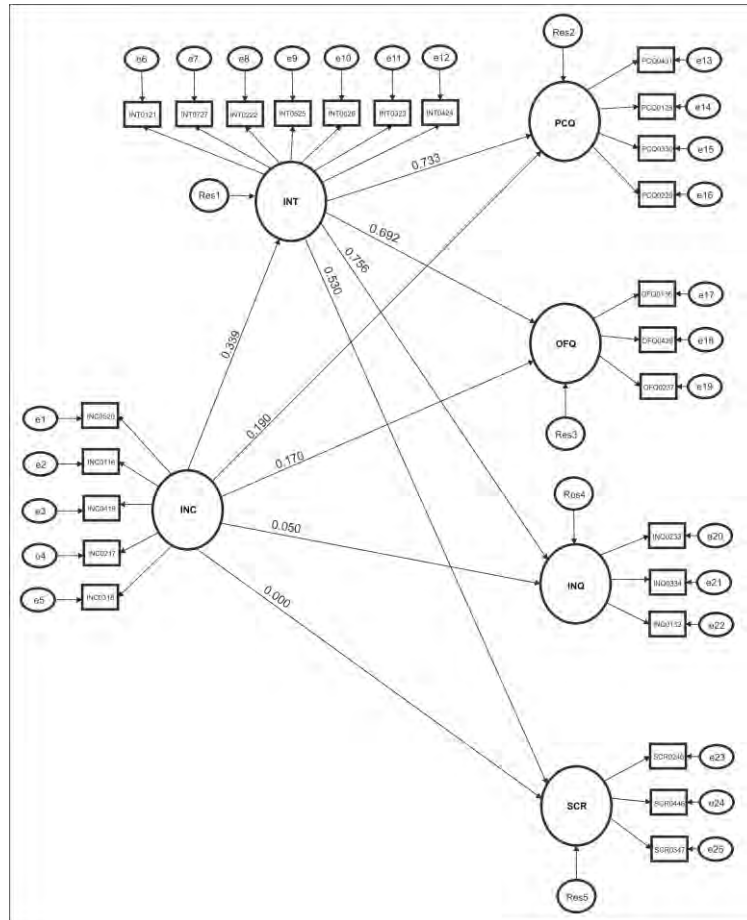


Note: $\chi^2/DF = 1.748$, CFI = 0.979, IFI = 0.979, RMSEA= 0.072
Figure 3. Results of SEM Analysis of Model 2

In the Table 3, test result of each model is indicated. In Table 4, the results of the research hypotheses are listed.

All the hypotheses except H_{4b} are supported. After INT was included into the model, the relationship between INC and sub-dimensions logistics service quality decreased considerably and turned out to be insignificant except OFQ. According to the results, it is concluded that INT mediates the relationship between INC and

PCQ, between INC and INQ, between INC and SCR. However, INT does not mediate the relationship between INC and OFQ.



Note: $\chi^2/DF = 1.925$, CFI = 0.937, IFI = 0.938, RMSEA = 0.080

Figure 4. Results of SEM Analysis of Model 3

Table 3. Test Results of the Models

Relationships	Model 1	Model 2	Model 3
Innovation Capability (INC) → Personnel Contact Quality (PCQ)	0.303*		0.019
Innovation Capability (INC) → Order Fulfilment Quality (OFQ)	0.449*		0.170*
Innovation Capability (INC) → Information Quality (INQ)	0.356*		0.050
Innovation Capability (INC) → Social Responsibility (SCR)	0.212*		0.000
Innovation Capability (INC) → Information Technology (INT)		0.398*	0.399*
Information Technology (INT) → Personnel Contact Quality (PCQ)			0.733*
Information Technology (INT) → Order Fulfilment Quality (OFQ)			0.692*
Information Technology (INT) → Information Quality (INQ)			0.756*
Information Technology (INT) → Social Responsibility (SCR)			0.530*

Note: Path coefficients are standardized

*p < 0.01

Table 4. Results of the Hypotheses

Hypotheses	Results
H ₁ : Innovation Capability positively affects Information Technology	Supported
H _{2a} : Information Technology positively affects Personnel Contact Quality.	Supported
H _{2b} : Information Technology positively affects Order Fulfilment Quality.	Supported
H _{2c} : Information Technology positively affects Information Quality.	Supported
H _{2d} : Information Technology positively affects Social Responsibility.	Supported
H _{3a} : Innovation Capability positively affects Personnel Contact Quality.	Supported
H _{3b} : Innovation Capability positively affects Order Fulfilment Quality.	Supported
H _{3c} : Innovation Capability positively affects Information Quality.	Supported
H _{3d} : Innovation Capability positively affects Social Responsibility.	Supported
H _{4a} : Information Technology plays a mediator role in the relationship between Innovation Capability and Personnel Contact Quality.	Supported
H _{4b} : Information Technology plays a mediator role in the relationship between Innovation Capability and Order Fulfilment Quality.	Not Supported
H _{4c} : Information Technology plays a mediator role in the relationship between Innovation Capability and Information Quality.	Supported
H _{4d} : Information Technology plays a mediator role in the relationship between Innovation Capability and Social Responsibility.	Supported

Note: Path coefficients are standardized

*p < 0.01

6. DISCUSSION AND CONCLUSION

Today, not only manufacturing companies, but also service companies have begun to regard quality service as a condition for success. In the worldwide market and under the conditions of increasing competition, to increase the service quality by providing customer-oriented service with the priority of customer satisfaction are also the main objectives of service businesses. Since all logistics activities are services, all logistics processes should be evaluated in the light of service quality. Logistics service quality has an increasing importance day by day due to its ability to affect customer satisfaction directly, thus profit and the performance of the entire organization (Water, 2003).

Logistics services are an element that provides value in supply chain management. Innovative developments in chain links will increase logistics performance and service quality (Burmaoglu, 2012). Innovative applications will provide competitiveness by improving logistics services and strengthening customer relations (Bolton, Grewal, & Levy, 2007). While innovation allows companies to increase their product and service quality, compete in global markets and minimize costs, with the increasing need of service activities of societies, innovation is becoming one of the most important issues in service sector (Toivonen and Tuominen, 2009).

This study aims to reveal the role of information technology use in supply chain innovation and logistics service quality. In this study, a questionnaire was applied to the companies operating in service sector, and the effect of the use of innovation and logistics information technologies on the quality of logistics service was investigated. Analyzes were made based on the data collected from 144 companies. As a result of the structural equation model analysis, it was determined that the innovation and use of logistics information technologies affected the logistics service quality positively.

The findings obtained at the end of the research are compatible with other studies in the literature. This research has important managerial implications. The results of this research have revealed the role of information technologies in the efficient use of innovation capacity for companies operating in logistics sector. Information technologies play a key role in the relationship between innovation and logistics service quality. During the research phase, links were established between some theories and approaches. In this way, different approaches were evaluated from a holistic perspective. The research question of the study was answered according to the method used and the findings obtained. All the hypotheses except H4b were supported in the findings of the study. After the inclusion of INT in the model, the relationship between INC and logistics service quality sub-dimensions decreased significantly and became insignificant outside OFQ. From the results, it was concluded that INT mediates the relationship between INC and PCQ, between INC and INQ, between INC and SCR. However, INT does not mediate the relationship between INC and OFQ.

According to the results, it has been determined that information technologies have a mediator effect between innovation in the supply chain and logistics service quality. One of the limitations of the study is that there is no distinction between companies receiving logistics services and companies providing logistics services. The scope of the study can be expanded by making this distinction in future studies.

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