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Investigating the Impact of Supply Chain Innovation on Performance through the Mediating Role of Strategic Agility

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Abstract

The present study aimed to investigate the impact of supply chain innovation on performance through the mediating role of strategic agility. The statistical population of this research consists of all employees and managers of the food industry in Tehran. Necessary data were collected with a standard questionnaire from 70 food industry managers who were selected by simple and easy non-probability sampling. The least squares method and SMART PLS software were used to analyze the model. The results of testing the hypotheses indicate the positive effect of supply chain innovation on firm performance and the positive effect of supply chain innovation on strategic agility was also confirmed. Strategic agility also had a positive effect on firm performance.

In addition, the results showed that supply chain innovation has a significant impact on performance through the role of strategic agility mediator. Therefore, by evaluating and recognizing supply chain innovation, it helps food industry managers to be more successful in the supply chain process. Develop a precise and codified plan to improve agility in accordance with the company's goals, significantly increase performance.

Keywords

Supply Chain Innovation, Performance, Strategic Agility

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Introduction

The globalization of the economy and the development of information technology have caused the supply-oriented market to change to the demand-oriented market and organizations to realize the importance of satisfying customer needs to maintain and survive (Sangari and Ramzi, 2015) Today, organizations need to be globalized and present in this large field in order to survive. In this regard, innovation is an area that has attracted the attention of many companies (Zokaei, K., Hines, P.A., 2007.)

Understanding that many competitors within an industry achieve the same level of competency in management areas has led many companies to innovate as a key factor in achieving competitive advantage and in search of factors for effective innovation(Chan et al., 2018). Among the factors that can affect performance improvement, innovation in the supply chain has a special place (Jean et al., 2014).To achieve a proper position in the world, organizations need to use modern science and sound management models such as supply chain (Zhang et al., 2015)Therefore, in recent years, much attention has been paid to chain innovation and it can be said that one of the essential issues in the success of any organization is to pay attention to the innovative environment in organizations. Therefore, in order to develop such activities in the supply chain process, organizations should use appropriate strategies to manage and control them. (Inman et al, 2011). Supply chain innovation in service and industrial companies seeks to benefit from logistics and improved agility performance throughout the supply chain as a strategic weapon for sustainable competitive advantage by creating utility and supply chain integration from an environmental perspective throughout the supply chain. The main feature of the supply chain is the communication of all its members (Tallon, P.P., Pinsonneault, 2011). Kaleh et al. (2018) showed that supply chain innovation can improve the agility of organizations in the long run. In addition, Afraz et al. (2020) showed that the development of innovation in the supply chain process is critical to achieving corporate profitability. However, the changes and consequences of supply chain innovation are unique to each company, and project-oriented companies must adapt to these unique changes. In order to adapt to the environment, these companies have to accept considerations in adopting their internal and external strategies and structures. (Wang et al., 2013) Whether a supply chain and its members want to become an agile supply chain depends on the view of managers and the environmental conditions of organizations. (Weingarten et al, 2014) The more stable, certainty, support, etc. an organization's environment has, the more organizations will be strategic in creating a supply chain based on agility because there is no need for flexibility of activities. And pay for their processes. But on the other hand, if there is excessive uncertainty in the environment, there are drastic changes in developing markets and needs change drastically, the dynamics of competitors to gain a stable competitive advantage and market share will increase and Therefore, it is necessary for organizations to move towards strategic agility (Kauppi et al., 2016) On the other hand, the improvement and development of strategic agility is directly affected by the supply chain strategy and its processes. In this regard, rapid understanding of market changes, responding to customer needs, improving quality, etc. all affect the development of performance and gaining a competitive advantage. These strategies can only be achieved through strategic agility in

understanding the changing needs of the market and customers (Teoh et al., 2017). In such an environment, successful companies, especially manufacturing and service industries, seek to use supply chain innovation, ie taking advantage of current competitive advantages and discovering innovations that determine future competitive advantage, as a key factor in achieving success in the supply chain process. However, the need for innovation-based activities and strategic agility simultaneously in the form of a strategic process leads to a significant impact on the success of service companies, the development of effective performance of resources commensurate with current and future activities. Therefore, supply chain innovation strategy in competitive organizations is a model in the process of decisions and activities, the main feature of which is the relationship between the organization and the external environment and is a determining factor in achieving performance development. Relying on strategic agility is also a way to improve development as well as aligning its strategy with changes and environmental uncertainty in environmental conditions. In this way, food industry managers will be able to be aware of their current position in supply chain innovation. And anticipate strategic agility, useful and effective planning to improve performance. The aim of this study is to investigate the impact of supply chain innovation on performance through the mediating role of strategic agility in the food industry.

Literature review

Supply Chain Innovation

Supply chain innovations can be defined as complex processes that deal with environmental uncertainty and respond to customer needs by using new technologies to improve organizational processes in new ways (Lee et al., 2011). Isaksson et al. (2010) further illustrated that the realization of supply chain innovations in the service sector can show benefits to stable competitive advantage, sustainable development, and services. Bello et al. (2004) argued that supply chain innovations include distributing activity sets and new investments to channel participants, to increase revenue through high service effectiveness and maximize joint profits by reducing costs through greater operational efficiency. Supply chain firms can coordinate and prepare to maintain alternative configurations effectively. Cohen and Levinthal (1990) explained that supply chain innovations can be increased by process compliance, which is a way to effectively apply features of supply and demand-side competence. Regardless of how supply chain innovations are defined, the problems associated with these innovations are clearly multiple and varied. As such, researchers have studied supply chain innovations in the field of operations management, but also in marketing (Archer et al., 2008; Cao, M., Zhang., 2011; Jajja et al., 2017), IS (Jean et al., 2012; Storer et al., 2014; Vickery et al., 2003), psychology (Aitken and Harrison, 2013), and other fields. The supply chain innovation concept has become increasingly important in business-to-business marketing research and practice, because of its potential effects on organizational outcomes, including operational efficiency (Ranganathana et al., 2011; Yaibuathet et al., 2008) although firms have recognized the importance of supply chain innovation; they still find it difficult to innovate in isolation. Indeed, as Sumo, Valk, Weele, and Bode (2016) concluded, collaboration among partners is necessary to incorporate innovation into

firms, and this involves integrating and exchanging information with others (Cao and Zhang, 2011)

Strategic Agility

The above literature review demonstrates that studies investigating the effects of agility and strategic agility on firm performance are generally conducted in the field of production and information technology. According to Swafford et al. (2006), value chain agility influences business performance. Ojha (2008) found that the ability to perceive market changes is an important determinant of strategic agility, which strategic agility has no direct impact on financial performance, and that strategic agility is beneficial in moderately ambiguous environments. In their study on manufacturing firms, Vickery et al. (2010) showed a positive impact of agility on firm performance. Tallon and Pinsonneault (2011) found a positive and clear link between agility and firm performance. Inman et al. (2011) reported a positive relationship between agile manufacturing and financial performance, marketing performance, and operational performance. Roberts and Grover (2012) tested the association between agility (customer sensing and responding capabilities) and firm performance. They found that, while customer sensing capability has a positive impact on firm performance, customer responding capability does not. Shin et al. (2015), in their study on Korean small and medium enterprises, found that strategic agility has a positive effect on operational performance and customer retention, but does not affect financial performance. Teoh et al. (2017) indicated that strategic agility is an important mediator between corporate risk management practices and firm performance.

Firm Performance

Supply chain performance (SCP) represents a construct which measures and quantifies the efficiency and effectiveness of the supply chain processes (Beamon, 1999; Li et al., 2006; Maestrini et al., 2018) in strengthening the market position. In order to evolve to an efficient and effective supply chain, supply chain management needs to be assessed for its performance (Gunasekaran et al., 2004). According to Balocco et al. (2011), efficiency seeks to maximize the output with the minimum input by reducing costs and waste (i.e. cost-related performance), while effectiveness aims to achieve supply chain optimization by increasing customer satisfaction (i.e. service-related performances). Often companies overemphasize efficiency improvements, and by neglecting effectiveness fail to achieve innovation goals (Zokaei and Hines, 2007). In order to enhance effectiveness, companies need to strive for innovation maximization in all possible areas, and Additive Manufacturing adoption is one of the viable investments for promoting rapid innovation and product design modifications (Chan et al., 2018), resulting with the increased customer satisfaction. Furthermore, as effectiveness seeks to be as flexible and customer oriented as possible, this again justifies the investment in Additive Manufacturing adoption as it contributes to flexibility advancements (Eyers et al., 2018). Given the research gap in the theoretical literature, it can be said that in all areas of the supply chain, for reasons such as lack of resources, responsible organizations will not be able to manage properly. However, compared to the limited resources that have approached the issue of supply chain innovation in a systematic and multidimensional way, the vast amount of available resources

have described only a part of the areas of the trust chain, which indicate different conditions, strategies and The supply chain model is based on the approach in this study. Therefore, according to the theoretical foundations, the research hypotheses have been formulated as follows:

1. Supply chain innovation has a positive effect on company performance.
2. Supply chain innovation has a positive effect on strategic agility.
3. Strategic agility has a positive effect on company performance.
4. Supply chain innovation through the role of strategic agility mediator affects the company's performance.

Based on the hypotheses, the relationships between the variables will be as shown in Figure (1). In the present research model, the concepts of supply chain innovation based on the study of Afraz et al. (2020) and strategic agility and performance based on the study of Kaleh et al. (2019) have been used.

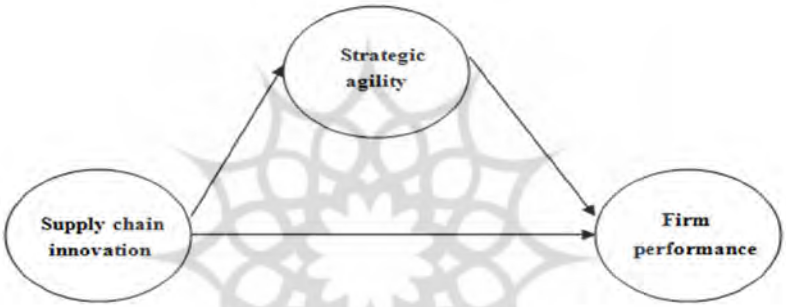


Figure 1 The proposed research model: Afraz et al (2020), Kale et al (2019)

Research methodology

The present research is considered as an applied research based on its purpose and in terms of data collection, it is a survey research. The structure of this research is designed based on the structural equation model. Therefore, the partial least squares (PLS) method has been used to analyze the data; first, the method does not rely on assumptions such as the normal distribution of observed reagents and the high sample size.

Second, according to Chain (1998), this method is used for the purpose of heuristics and the exploration of possible relationships. The number of sample size using the relationship of determining the sample size in a limited population (Azar and Momeni, 2016), taking into account the maximum variance and the level of error of 5%, 85 people were identified to increase the return rate of the questionnaire and ease of research more than 100 The questionnaire was distributed electronically, of which 70 managers of the food industry completed the questionnaire and this number was the basis for analysis and testing of hypotheses. The standard questionnaire of Afraz et al. (2020) was used to measure supply chain innovation and the standard questionnaire of Kaleh et al. (2019) was used for strategic agility and performance.

Descriptive study of research variables

In this research, three main variables have been selected to be studied based on a conceptual model. The description of a variable is important because the test results of research hypotheses are extracted based on the data and indicators of these variables. Research data have a distance scale. To describe the research variables, central and dispersion indices have been used, which are discussed below. Is the average of their answers different from the average of 3 (the middle number of the Likert spectrum) or not? If the mean value obtained is less than 3, it indicates that the study population has an unfavorable status index in that case (in the case of inverse variables, it is the opposite). Also, the larger the absolute value of the skewness and elongation coefficients, indicates the deviation and difference of the sample in terms of symmetry with the normal distribution, so that if the absolute value of these coefficients is in the range (1 and -1), it indicates no distribution deviation and variable curve compared to a normal distribution is.

Table 1. Descriptive indicators for the dimensions of research variables

elongation	skewness	standard deviation	mean	Sample size	Research variable
0.577	- 0.291	3.092	3.26	86	**Supply chain innovation**
- 0.284	۰,۲۱۰	3.381	3.17	86	**Strategic agility**
- 0.737	- 0.318	4.628	3.47	86	**Function**

According to Table 1, it can be seen that all variables are in good condition.

Results

In this research, partial least squares (PLS) method has been used to analyze the data. First, this method does not rely on assumptions such as the normal distribution of observed reagents and the large sample size. Second, this method is used for the purpose of predicting and exploring possible relationships. In other words, unlike methods based on covariance that try to adapt the data to the theoretical model of the research, this method seeks to discover the theory that lies in the data. The findings of this study are divided into two general parts. The first category of findings is dedicated to the validity and reliability of structures and targets.

In the partial least squares method, two instruments, AVE and CR, are commonly used to evaluate the reliability of structures. Since Cronbach's alpha provides a more rigorous estimate of the internal reliability of variables, composite least squares path models use composite reliability gauges. It is possible. Of course, it does not matter which reliability coefficient is used, in any case the Cronbach's alpha value should be greater than 0.7.

According to Table 2, CR and Cronbach's alpha for all structures is greater than 0.7. The coefficient of determination (R2) measures the explanatory variance of an endogenous variable relative to its total variance by exogenous variables. For this index values greater than / 670. Strong, greater than 333 /. Average and less than 190 /. It is considered weak. In fact, this

coefficient indicates that the variable or independent variables explain what percentage of the dependent variable changes.

Table 2. Results of validation of variables

R2	CR	Cronbach's alpha	AVE	Variable
-	0.859	0.851	0.770	**Supply chain innovation**
-	0.860	0.849	0.672	**Strategic agility**
-	0.947	0.902	0.699	**Function**

Also, according to the numbers calculated for the indices, it is observed that all CR values are greater than 0.7 and AVE values are greater than 0.6, so we see the reliability of the compound or structure. Table 3 deals with divergent validity in addition to examining correlation coefficients. According to this index, the variance of each latent variable must be greater for its own indices than other indices. To determine this, the AVE root of the latent variables is first calculated and then the result is compared with the correlation values that this latent variable has with other latent variables. The square root of AVE must be greater than the values of the correlations. This should be done for all latent variables. The results of the Fornell and Larker index can be seen in the table below. One column of this table shows the second root of the mean variance explained (AVE). Confirmation of divergent validity requires that the value of the second root mean of the explained variance is greater than all the correlation coefficients of the relevant variable with the other variables. For example, the second root is the mean variance explained for the internal value exchange variable (82.5%), which is greater than the correlation value of this variable with other variables. As shown in the table, the value of the second root of the explained mean variance index, for all variables, is the correlation of that variable with other variables.

Table 3: Correlation matrix and mean root of variance of the extracted model

ROOT AVE	performance	Strategic Agility	Supply Chain Innovation	Hidden variables
0.825			1	**Supply Chain Innovation**
0.802		1	0.26	**Strategic Agility**
0.900	1	0.378	0.549	**performance**

Goodness of Fit index (GOF)

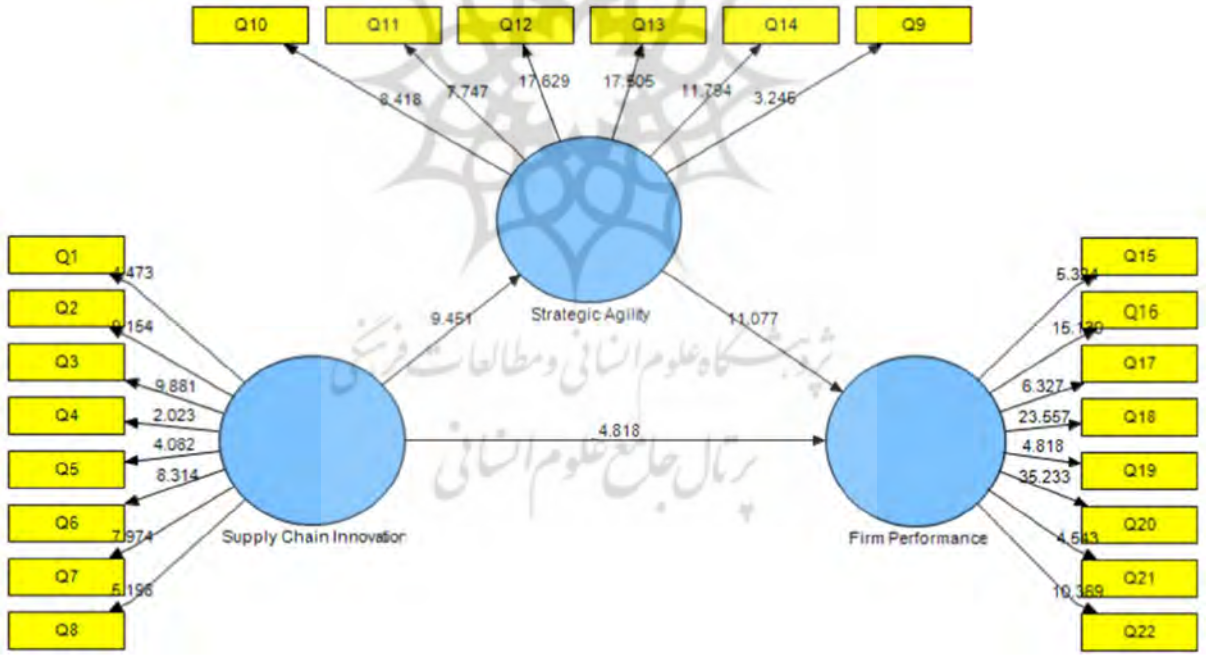
This index shows the compromise between the quality of the structural model and the measured model and is equal to:

$$GOF = \sqrt{\overline{AVE}} \times \sqrt{\overline{R^2}}$$

In this formula $\overline{AVE}$ and $\overline{R^2}$ are the mean of AVE and R۲. A high index of goodness of fit indicates a 0.4 fit of the model. The value of the fit index is equal to 0.776 and is greater than the value of 0.4 and indicates a suitable fit of the model. In simpler terms, the data of this research have a good fit with the factor structure and theoretical basis of the research, and this indicates that the questions are in line with theoretical structures.

Hypothesis testing

The second set of findings of this research is dedicated to testing the structural model and research hypotheses for this purpose from the path coefficient and the coefficient of determination obtained by the partial least squares algorithm with SMARTPLS software. The path coefficient of the contribution of each of the predictor variables in explaining the variance of the criterion variable shows. Bootstrap algorithm is used to calculate the value of T statistic. Figure 2 shows the T-statistic for path coefficients and Figure 3 the final research model is



estimating path coefficients.

Figure 2 Structural model in a meaningful state

H1: Supply chain innovation has a positive effect on company performance

The research hypothesis that there is an impact of supply chain innovation on the company's performance has a value of 4.818 which has become significant at the 95% confidence level (more than 1.96), so with 95% probability the researcher's claim is confirmed. A positive beta value (0.320) shows that supply chain innovation has a positive and significant effect on company performance.

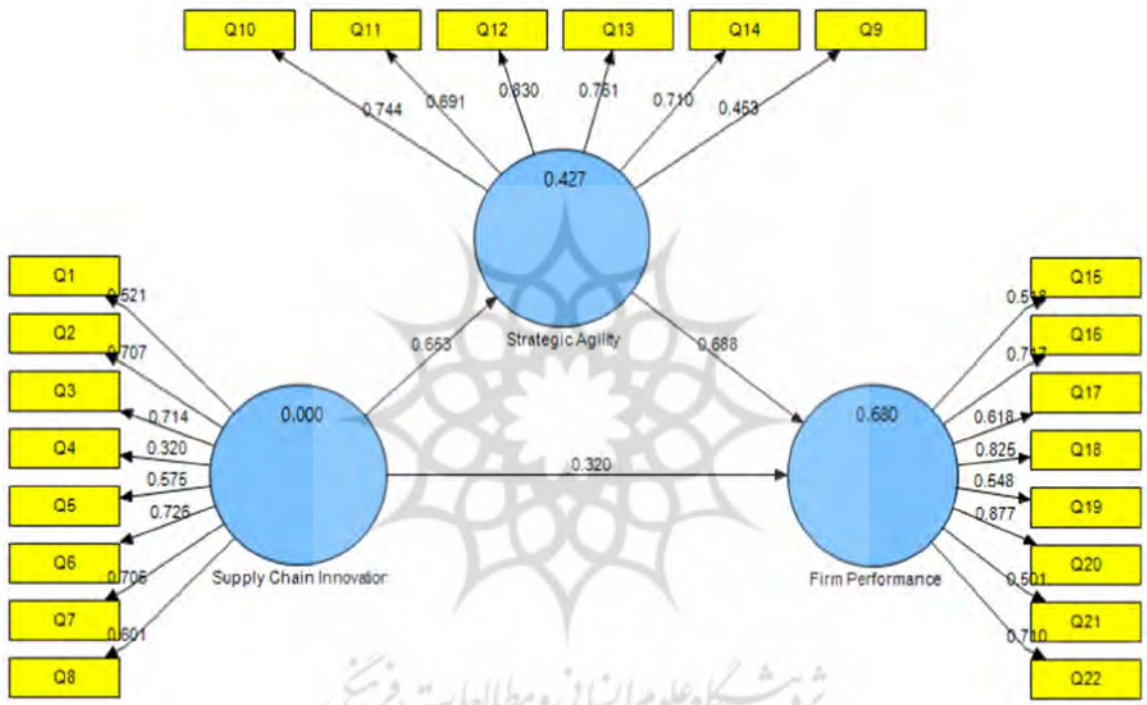


Figure 3 Structural model in standard mode

H2: Supply chain innovation has a positive effect on strategic agility

The research hypothesis that there is an effect of supply chain innovation on strategic agility has a value of 9.451 which is not significant at the 95% confidence level (more than 1.96), so the researcher's claim is rejected. Beta value (0.653) shows that supply chain innovation has a positive and significant effect on strategic agility.

H3: Strategic agility has a positive effect on company performance

The research hypothesis that there is an effect of strategic agility on the company's performance has a value of 11.077 which is not significant at the 95% confidence level (more than 1.96), so the researcher's claim is confirmed. A positive value of beta (0.688) shows that strategic agility has a positive and significant effect on company performance.

H4: Supply chain innovation through the role of strategic agility mediator affects the company's performance.

The research hypothesis that there is a mediating effect of strategic agility on the relationship between supply chain innovation and firm performance has a value of 5.822 which has become significant at the 95% confidence level (greater than 1.96), so with a 95% probability of claim The researcher is approved. A positive value of beta (0.769) shows that the strategic has a positive and significant effect on the relationship between supply chain innovation and company performance.

The values of path coefficients and t-statistic along with the results of the hypotheses are presented in Table (4). Therefore, data analysis by PLS software, the results of rejecting or confirming the hypotheses in Table 4 are significant.

Table 4: Results of hypothesis testing

Hypothesis	Path	Path estimate	t-value	Test result
H1	Supply Chain Innovation → Firm Performance	0.320	4.818	**Accepted**
H2	Supply Chain Innovation → Strategic Agility	0.653	9.451	**Accepted**
H3	Strategic Agility → Firm Performance	0.688	11.077	**Accepted**
H4	Supply Chain Innovation→ Strategic Agility → Firm Performance	0.769	5.822	**Accepted**

Discussion and conclusion

The conceptual model presented in this study is presented to measure the impact of supply chain innovation on performance through the mediating role of strategic agility in the food industry. Findings can be useful for the food industry in terms of strategic agility for the performance of manufacturing and service companies. The research findings also help marketing managers to develop appropriate strategies to create strategic agility in the supply chain process. Accordingly, managers have to spend money to develop supply chain innovation in the production environment. In addition, these results prove that supply chain innovation is a key strategy tool to improve company performance and an appropriate approach for managers to integrate innovative policies and agile strategies in the context of the supply chain process. However, the results related to the analysis of the relationship between the variables of the research model under consideration hypothesize the primary impact of supply chain innovation on the performance of the company And it has been confirmed that by studying the Kalea et al. (2018) Kern et al. (2012) this shows that because the concept of supply chain innovation is based on a theoretical framework and this framework includes the theory of behavioral decisions in Innovative that will increase performance development. The presentation of the second hypothesis of the research also characterizes that supply chain innovation affects strategic agility. The current results are consistent with the current results obtained by the Survey of Employees (2020) and Workers & Associates (2018). This suggests that managers should choose a process that leads to the development of agility if they engage in innovative activities. The more adequately and appropriately the management of the planning unit and the use of information technology by management in the supply chain process, the more agility increases. Strategic affects the performance of the company. The current results are consistent with the current results of the Delis and Daniel (2019) and David et al. (2019) and Prim and Wink (2012) surveys. According to these studies, managers should use agility-based approaches in a competitive environment; because beneficial and long-term effects and results in agility development can be seen. In other words, the more strategic agility such as risk-taking, more efficient competitiveness, opportunism increases, the better the company performance. In addition, the mediator hypothesis showed that strategic agility has a positive effect on the relationship between supply chain innovation and firm performance. which is consistent with the research of Afraz et al. (2020), Marshall et al. (2015) and Zokas et al. (2015). They have observed the supply, which is not far from the eyes of the respondents. This shows that investing in supply chain innovation and using this sector efficiently and effectively, leads to agility in a competitive environment, which in turn, improves performance. In line with the results, the following practical suggestions are made: It is suggested that managers take a more serious look at innovation in the supply chain process and by designing an integrated internal system with a marketing system, to fully deploy and benefit from its beneficial results. The research results suggest that employees who need more innovation and entrepreneurship in their units in the study industry (such as research and development staff), can be influenced by the supply chain innovation approach. Managers are advised to use strategic agility with parallel organizations to enable employees to participate in scientific and professional committees and exchange ideas and

information, which will have a better, faster and more direct impact on gaining the desired competitive position and effectiveness of company performance. However, it is necessary to evaluate the value of services and products in order to achieve the desired result. Awareness and knowledge of managers of organizations about the effect of supply chain agility on the profitability of the organization causes activities to be done to streamline the supply chain to ultimately improve the performance of the organization. As a result, managers can take steps to increase agility by taking steps to increase the ability to detect changes and react quickly and take advantage of them. Agility is used to help companies deliver a quality product in a short time and quickly, based on customer needs. Therefore, managers can achieve better performance, greater profitability, and subordinate results by putting in place programs to increase supply chain innovation. Strategic agility facilitates rapid accountability between partners, suppliers and customers. As a result, the managers of the organization can take steps to improve the IT infrastructure, to achieve greater performance and results of its function. As a result, the managers of the organization can take steps to innovate in the supply chain process and create temporary networks of independent companies that share information, competencies, infrastructure and business processes through information technology, Achieve greater performance. Given that supply chain agility as a whole improves the performance of the entire organization, effective measures in this area such as improving its capabilities such as responsiveness, speed, flexibility, information technology, staff skills development and virtualization can have a significant impact on profitability. It is suggested to develop a strategy based on supply chain innovation based on the company's understanding of customer needs, to finance from internal and external sources, and in this regard by helping the company units to each other and taking initiative in important decisions, Increase agility. It is suggested that based on the development of supply chain innovation using new technologies, new supply chain knowledge and new production processes, knowledge and science be introduced into the company from outside the organization in order to increase strategic agility.

Limitations and suggestions for future study

In the present study, despite the full coverage of the research objectives, due to limited access to resources (financial and temporal), a number of limitations are observed. The first limitation is related to the data. Due to the fact that the data were collected from the city of Tehran, as a result, the obtained results cannot be generalized to other statistical communities. Future studies can cover this limitation by considering sampling on a larger scale. The second limitation is in research methodology. It is suggested that in future research, to study the strategic agility in the supply chain process, experimental (experimental) methods and design of different scenarios be used to study the strategic agility in the supply chain process. Future studies can examine how gender plays a role as a moderator in the relationships between research variables. Certainly, the main limitation of any research project is the inability to generalize research results to other statistical communities. The present study is no exception to this rule and its results cannot be generalized except to the place and statistical population of this study.

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