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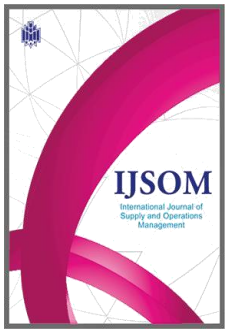

The Effect of Supply Chain Agility Based on Supplier Innovation and Environmental Uncertainty

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Abstract
Today, the survival of companies is directly related to the ability of companies to enhance competitiveness which the supply chain agility plays an important role in this regard. This study was conducted by the purpose of determining the effect of supplier innovation and environmental uncertainty on supply chain agility with the mediating role of information sharing, strategic resourcing, supply chain orientation and market orientation in Parts suppliers of Sazeh Gostar Saipa Company (SGSC). This is an applied research which is descriptive-survey in terms of method, and the statistical population consisted of 515 managers of parts suppliers of SGSC. The Cochran formula was used by SPSS 22 software to determine the number of samples, where of 228 managers participated in this study totally. Standard questionnaires were administered to them. Correlation test results showed that there is a significant positive relationship between the research variables ($p<0.01$). Also, the results of structural equation modeling by LISREL9 showed that the model presented in this study has a suitable fit and the set of factors that influenced the supply chain agility in this model can explain 98% of the changes in supply chain agility ($R2=0.98$).

Keywords: Innovation; Uncertainty; Agility; Information; Strategic; Supply chain orientation.

1. Introduction

Organizations have always been faced with challenges of environmental changes and now they are extensively faced with environmental uncertainty, including the dimensions of competition and market behavior.). In this regard, Jafar Nezhad and Darvish (2009) argue that the change and turbulence are considered as integral parts of business in many markets supply chain. Managers have to accept uncertainty and, at the same time, organize and develop a suitable strategy to coordinate supply and demand with reasonable cost.

In addition, it is evident that no company has all the necessary resources to put any opportunity on the market. Therefore, to gain a competitive edge in the global market, companies must work with suppliers and customers to uniform synced operations and achieve a level of agility beyond the reach of exclusive companies, which in general has been conveyed to the chain of agility (Abdi and Abumusa , 2017).On the other hand, over the past decade, companies have faced the growing global competition due to business agreements, the removal of business barriers and increased access to global markets' consumers (Tizro et al., 2011). Companies have also faced rapid technological changes, the growing uncertainty and market dynamism, reducing product lifecycles, and the growing market segmentation in the global environment. Therefore, the organization's ability to quickly adapt to environmental changes and market conditions is an essential element of their survival (Agarwal et al., 2007; Van Hoek, 2011). In such a situation, the importance and necessity of implementation of the agile supply chain becomes more evident, because such a chain can react quickly and effectively to market changes (Power, 2011; Qrunfleh, & Tarafdar, 2013). On the other hand, supply chain management has been identified as one of the key factors in the competitiveness and success of organizations and the pursuit of agility in the supply chain as a synthetic concept in supply chain management has now attracted the attention of many managers and

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experts and researchers are seeking to provide new dimensions of this emerging concept (Kazazi & Sohrabi, 2010). Supply Chain Management (SCM) manages controls and coordinates supply and demand planning, preparing materials, producing and planning products, controlling the stock, distributing, delivering and serving(Fakhrzad et al.,2018). In general, today's review of organizations shows that past approaches and solutions have lost their abilities to cope with organizational challenges and contemporary external environments (Mandal, 2016; Moniruzzaman et al., 2016). Hence, new approaches are needed where agility is among them (Chegeni et al., 2016). In the meantime, the importance of agile supply chain is further enhanced, because such a chain can respond quickly and effectively to market changes (Gebrekidans, 2016). Today, the use of an agile supply chain is critical to achieve success and create a competitive advantage (Kim & Chai, 2017). at studies have shown that the improvement of supply chain agility can bring about better financial performance (Gligor, 2013) and is especially important to take advantage of this to improve overall business performance, especially for organizations with a high order level (Um, 2016).

Competitiveness is a topic that has always dedicated a huge part of organizations and companies focus to itself especially among manufacturing companies (Fernando, 2017). The survival of companies in this turbulent world is directly related to the ability of companies to enhance their competitive power, which in the meantime, the supply chain agility role (Fernando, 2017; Zutshi et al., 2015;). utilizing an agile supply chain, while facilitating the delivery of goods from producer to consumer, provides production conditions to manufacturers in such a way that companies cope with a minimum cost of stopping production or overstock of raw materials (Seyedhoseini et al., 2010; Sukati et al., 2012).Accordingly, it can be argued that its competitiveness and growing trend have led manufacturing companies to use various methods and techniques to successfully compete, and the supply chain is one of the paradigms of production which has been particularly important in this regard, but how to achieve it has always been a challenging issue for companies (Khan & Pillania, 2008).There is a controversy among researchers in solving this problem, and it cannot be clearly stated what the most important and suitable variables are to achieve an organization's agility (Mandal, 2006). The complexity of the topic is more evident when the studies conducted in this field show different variables to manufacturing companies' managers, while the presented models are not in the form of a developed model; (Moniruzzaman et al., 2016; Gebrekidans, 2016). Experimental studies show that supplier innovation can have a direct impact on the companies' supply chain agility whosefinal outcome can be pursued in the competitive advantage of companies. What justifies this is the use of suppliers from innovations that discourage other competitors at high speed in the field of competition and manufacturing companies can more confidently plan their productions and distributions (Chen & Wu, 2015). However, the lack of studies in this field has made the impact of supplier's innovation on the agility of the organization vague and obscure, and it is not clear what mediator variables i.e. quality and competitive can do in facilitating this relation (Kim & Chai, 2017).In the meantime, surveys show that the information sharing of companies with a supplier can be very important in relation to the state of production and its scheduling system (Kocabasoglu & Suresh, 2006). As expected, sharing information can justify a mediating role in the relationship between the supplier's innovation and its adaptation to the supply chain agility (Kim & Chai, 2017).

On the other hand, paying attention to another concept such as strategic resources is very important in these relationships. It encourages the manufacturers' strategy to be in line with the supplier's strategy, which in turn leads to better collaboration with changing business environments. Strategic resources consist of four main dimensions: strategic purchasing, internal integration, information sharing and supplier development (Chiang et al., 2012). Evidence in this section also confirms that attention to the strategic resources focusing on strategic purchases can play an important role in the relationship between suppliers' innovation and the supply chain agility (Kim & Chai, 2017). However, another basic principle of supply chain agility has been neglected: environmental uncertainty. This makes it difficult for companies to properly have strategic management with their suppliers and recent evidence suggests that the environmental uncertainty that companies face effects on two issues: supply chain orientation and market orientation and these two important ones will effect on the supply chain agility. there is also a lack of studies in this field (Gligor et al., 2016).The evidence from the two recent studies (Kim & Chai, 2017; Gligor et al., 2016) clearly confirms that companies should have special attention to basic contexts, environmental uncertainty and supplier innovation, in supply chain agility both of which affect the supply chain agility through mediator variables. In the real supply chain environment, retailers need to protect themselves from uncertainties in demand and supply. Demand and supply chain planning is very complex (Harbi etal., 2018).

However, the lack of examination of the two models presented in the form of a comprehensive and developed model makes it impossible to correctly determine which of the two principles referred to in recent studies (i.e., uncertainty and supplier innovation) has more effect on supply chain agility. Accordingly, in the present study, the researchers try to answer the question what effect supply innovation and environmental uncertainty have on supply chain agility and what the roles of mediating are in information sharing, strategic resources, supply chain orientation and market orientation.

In the following, the theoretical framework is presented to study and compile the research hypothesis. Next, the research method and findings have been presented and finally, the discussion and comparison of the findings have been done.

2. Theoretical framework

2.1. Uncertainty and the supply chain agility

Environmental uncertainty refers to inability to determine probabilities with a degree of certainty about how the environmental factors affect on the success or failure of the decision-making unit in supply chain. Environmental uncertainty also refers to a variety of external forces that an organization must interact with (Ajibolade et al, 2010).In many markets, changes and turbulence have become an integral part of business. In this way, supply chain managers must accept uncertainty and, at the same time, organize and develop a suitable strategy to coordinate supply and demand at an acceptable cost (Jafarnezhad & Darvish, 2009). Environmental uncertainty is a key variable that affects organizational structure. The relationship of environmental uncertainty for each of the four characteristics (i.e., centralization, formalism, complexity, and integrity) affects the organizational structure (Gordon & Narayanan, 2007).Social factors changes that emerge in order to protect the environment, labor expectations, and legal pressures are necessary to maintain a company and attract enough customers to generate positive cash flow and profitability. an environment of uncertainty requires rapid response to changes or so-called agility. The needs of organizations that prefer to respond more quickly to the needs of their customers, the changing environment of competition and the increasing complexity of the environment have led to the emergence of agility (Gligor et al, 2013). Todays, firms are in a global environment, which is surrounded by complexity and uncertainty. This uncertainty has a profound effect on the company's activities, especially the supply chain. On the other hand, accelerating the various changes and tight competition between companies reveal the need to accelerate the company's operations and its flexibility more than ever before. Agility of the supply chain is one of the most important factors in achieving the company agility and can meet the strategic goals of the company in today's competitive world (Nasrollahi et al., 1395). Accordingly, the first hypothesis was developed as follows:

H1: Uncertainty affects supply chain agility.

2.2. Uncertainty and supply chain orientation

The orientation of the supply chain links the upstream processes (the initial suppliers, including all processes involved in purchasing and transportation) to downstream processes (including all processes involved in distributing and delivering products to final customers) (Esper et al.,2010). Building up a chain and trying to increase the benefits of the entire supply chain are essential to survival and success of current markets. Manufacturers, suppliers, distributors, warehouses, retailers and customers have tried insuring themselves in global markets through building a network of organizations and activities in the form of a supply chain. That is, organizations work together to achieve common goals, and they have an optimal supply chain orientation, and the benefits are not shared among the members of the chain so that each component of the chain merely seeks to increase its profit. This will be achieved when the members of the chain can make the necessary coordination. In this case, the only hypothesis for chain success is provided, but it is not enough to guarantee it. Because the current markets are rapidly developing and each chain has strong competitors who offer more options to customers, , each chain has several options to choose its members and facilities; it also needs the most appropriate option to succeed and to have more competitive advantages over its competitors (Adabi, 2014). Todays, many executives know that actions taken by one of the chain members can affect the profitability of all other chain components. Companies often compete with other supply chains a part of the supply chain and do not compete with their supply chain components. Costs of poor coordination between components can be extremely high. In this regard, the important issue of identifying and managing the risks in the cycle cannot be ignored. Basically, due to the nature of risk, risk management needs to create a comprehensive and holistic attitude on organizational workflow and activities. To guide and control all steps involved in creating, shaping, documenting and controlling risks in the chain, supply chain orientation must be oriented towards creating value for customers and companies as a part of the supply chain often compete with other supply chains and do not compete with their supply chain components (Naini et al., 2011).The orientation of the supply chain components can affect the chain agility. Therefore, an agile supply chain is able to adequately respond to changes in the workplace. Agility in the supply chain is the ability of a supply chain to respond quickly to market changes and customer needs (Gligor et al., 2016). Accordingly, the second hypothesis was developed as follows:

H2: Uncertainty affects supply chain orientation.

2.3. Uncertainty and the company market orientation

Market orientation is a kind of behavioral norm that extends across the organization and is responsive to current and future needs of the market and customer through innovation. Market-oriented companies have a competitive advantage in responding quickly to market and customer needs; they also act effectively in response to market opportunities and threats (Kumar et al., 2011). Also, the market-oriented approach is to learn about the market and use it in marketing actions. The company's market-orientation is considered as a philosophical approach to the marketing of customers, competitors and many factors affecting on the needs and preferences of customers (Murray et al., 2011). According to Narver and Slater (2000), the environment in which modern companies are located is an environment of complexity and uncertainty. Customers are increasingly pushing companies to get better products, services and companies in order to gain competitive advantage and success in this turbulent environment must place their customers and their needs and wants at the center of their business and attention because today business environment is extremely influenced by the competition between companies and the rapid technological changes and the continuous change in the demands and

needs of customers. The market-oriented approach contributes to the real implementation of this concept. Therefore, it can be said that market orientation lies in the concept of marketing. Market orientation isconcerned because with increasing competition among manufacturers, uncertainty rises, and the market orientation puts customers at the center of attention and seeks to create a superior value for them. The market orientation considersto create a superior value for customers, competitors and their strengths and weaknesses as well as inter-tasking coordination. Market-oriented companies have a competitive advantage in responding quickly to the needs of the market and customers in today's turbulent market. Accordingly, the third hypothesis is as follows:
H3: Uncertainty affects the company's market orientation.

2.4. Supplier innovation and supply chain agility

Innovation is a common process even in established sectors and creates opportunities for organizations to seize new markets and eliminate stagnation and downturn and threaten existing businesses (Racela, 2014). The world around and subsequently the management practices are changing and to succeed in a different world, there should be a different management. Agility is one of the important factors that enables the manager to deal with changes more correctly, faster and effectively, utilize the potential opportunities created by the change in the best way, work to improve the organization and to meet the goals and future needs of the organization and also introduce high-quality products and services in a relatively short period of time, create competition and some kind of market differentiation from a variety of aspects such as cost, quality, delivery time, flexibility, quick response. In this regard, innovative suppliers can have an effect on agility (Golavar, 1394). The agile supply chain embraces a set of companies that are separate from each other and interdependent at the same time. In this way, companies to surpass competitors must be united with suppliers to achieve a level of agility in the supply chain. In this context, supplier innovation plays a crucial role in the agile supply chain so that choosing an innovative supplier sometimes becomes a vital issue for the organization (Kim and Chai, 2017). Accordingly, the fourth hypothesis is as follows:
H4: Supplier innovation affects supply chain agility.

2.5. Supplier innovation and information sharing

Sharing information is the most basic form of coordination in supply chains (Kazemzadeh et al., 2013). Information sharing is described as "foundation", "core element", "center of nervous system" and "main need" of coordination. Therefore, chain partners should share their information to facilitate supply chain coordination (Zhang et al., 2009). Information technology capabilities such as core competencies belong to sharing information. As with the developments in information technology (such as the Internet, Intranet and Extranet), much of the transaction costs associated with data transfer have been reduced and a large amount of information is sharing at the right time and with a desirable quality. Also, given that the supplier plays an important role in the organization's supply chain, supplier innovation can help to obtain the resources needed for successful implementation of information sharing and the creation of a supportive participatory culture (Frazier et al., 2009). In organizations that benefit from supplier innovation and information sharing between the supplier and other components of the supply, long-term relationships with the chain partners are encouraged through social norms and trust instead of legal and inflexible contracts. in such organizations, sharing will be of great importance as a mechanism to create coordination and cooperation with supply chain partners (Prajogo and Olhager, 2012). Accordingly, the fifth hypothesis is as follows:
H5: Supplier innovation affects information sharing.

2.6. Supplier innovation and strategic resources

Strategic sources refer to the company's attention to the supply of raw materials and other requirements that are considered as important and strategic issues. Therefore, it is referred to as strategic resources, so that the company without paying attention to them, they can suffer frommuch damage, and if these important and strategic resources are timely delivered, the company will have better ability and performance to meet the future customer needs (Kim & Chai, 2017). The tendency to innovate in the supplier affects the way of purchasing between buyers and suppliers. Innovation in products and processes affects decision making about strategic supply chain resources (Oke et al., 2013). Supplier innovation pays careful attention to the supply of initial resources; therefore, the purchase and procurement strategy is of great importance and cases such as timely delivery of raw materials, reducing the backwardness of rapid technological changes, sufficient material transportation, sufficient inventory and cost savings are the characteristics of supplier innovation (Kibbeling et al, 2013). In purchases with strategic importance, raw materials and parts are purchased when required at various stages of production. This way of purchasing and managing inventories allows the materials to be purchased on time and used at the same time in the production process, resulting in significant savings in costs due to lower inventory levels. Given the increasing competitiveness of today's companies and timely production, the presence of suppliers that can help companies in this situation is essential (Myreen, 2010). Accordingly, the sixth hypothesis is as follows:
H6: Supplier innovation affects strategic resources.

2.7. Information sharing and supply chain agility

Establishing a shared information system between the company and suppliers, sharing information between different units, business and electronic procurement development in the supply chain, and using artificial intelligence in decision making are the capabilities of information technology to achieve agility (Kazazi and Sohrabi, 2010). Information technology tries to save the organization's time, money and agility by creating direct channels of receiving information between the sales centers and the main office, establishing an electronic portal to obtain information about customer orders and controlling daily sales , making connection between the logistics department and the product development department, coordinating between sales and operation departments, and most importantly sharing the information (Huanga et al., 2012). Accordingly, the seventh hypothesis is as follows:
H7: Information sharing affects the supply chain agility.

2.8. Strategic resources and supply chain agility

One of the areas where managers have focused on it more is purchasing and resourcing management. In the last decade, purchasing management in the supply chain has been a challenge for major companies, and achieving a global competitive level in supply has become a major need. Therefore, companies must carefully review their purchasing strategy to cover environmental turbulence. In addition, companies must pay attention to the fact that choosing a strategy will affect market competition (Monczka et al., 2015). Purchasing decisions affect the nature and scope of supply chains. Managers who make these decisions can shape their cost, risk, and performance structures (Wang, 2010). With the growing importance of supply chain agility, buying patterns have a central role that can boost a company from a temporary purchaser to a strategic partner. Having a purchasing strategy can also be effective in increasing the supply management capabilities. With regard to the importance and expansion of supply chain agility in organizations, the importance of targeting the purchases has also doubled. The effect of improving the performance of these two sections is visible on the performance of the organization in a variety of ways, such as reducing inventory, increasing sales, decreasing customer waiting time and many other things that ultimately lead to improve company performance (Baghebani, 2011). Accordingly, the eighth hypothesis is as follows:
H8: Strategic resources affect the supply chain agility.

2.9. Supply chain orientation and supply chain agility

Companies should pay due attention to supply chain orientation in order to manage the relationship with the main supplier, because this will lead to create relationship management with the main supplier and also companies gain better performance outcomes and expand the supply chain view by creating a supply chain orientation (Mehrabani & Hasanzadeh, 2015). To guide and control all the steps involved in creating, shaping, documenting and controlling the risk in the chain, supply chain orientation must be oriented towards creating value for customers (Naini et al., 2011). Supply chain orientation can improve the strategic resources and competitiveness of the company and possibly improves agility of the company's supply chain. (Qrunfleh & Tarafdar, 2016). Accordingly, the ninth hypothesis is as follows:
H9: Supply chain orientation affects supply chain agility.

2.10. The company market orientation and the supply chain agility

Market orientation is a set of interdisciplinary activities and processes that provide customers satisfaction through continuous assessment of their needs. In general, competitor orientation is not emphasized. Companies that would like to be market-oriented should know about their customers current and future needs, so that they can add value to them. Companies should identify and satisfy their customers' needs; employees in market oriented organizations pay much attention to the quality of services that they provide. Also, the staffs of such organizations spend a great deal of time with their customers. Becoming market orientation and staying market orientation are essential for the success of companies (Rajoii, 2009). Under certain environmental conditions, market orientation may have a little effect on the company's performance and be more influential under other environmental conditions. Companies with market-oriented behaviors consider the needs expressed by customers in the market and try to make goods and provide services that can meet those needs. Market-oriented companies increase their awareness of their customers' needs and wants by evaluating them and can provide new products and services in line with the market and the customer. Hence, the need to new approaches is felt, agility being one. In this way, one of the most important factors in winning the competition is the promotion of supply chain agility. an industrial organization is competitive that has powerful and competitive components and agility together. That is, the company supply chain must have competitive suppliers with globally competitive capabilities and also a chain with agility concepts. (Qrunfleh & Tarafdar, 2013). Accordingly, the tenth hypothesis is as follows:
H10: The Company's market orientation affects the supply chain agility.

According to the presented models as above, the conceptual model of this research was developed as follows (Fig. 1).

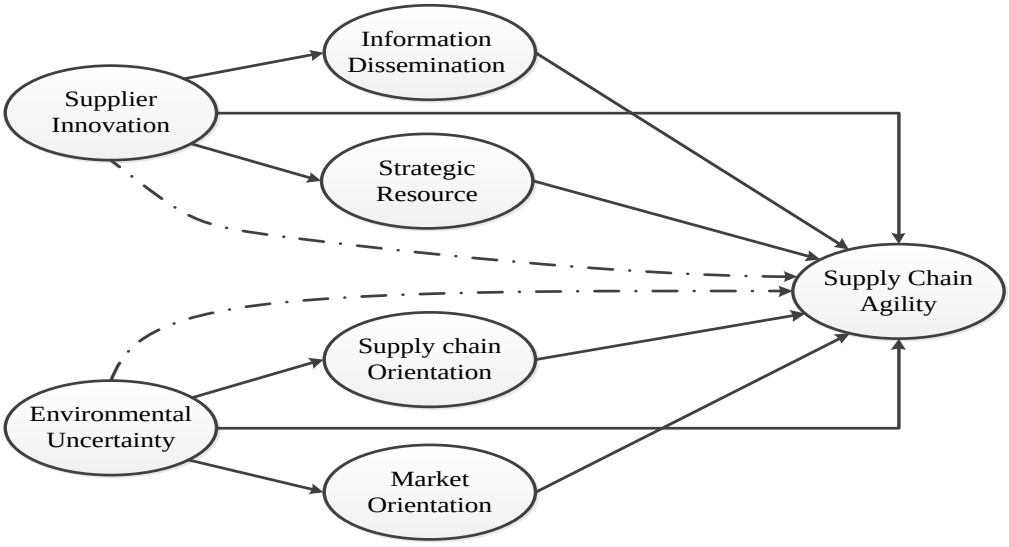

Figure 1. Conceptual Model

3. Research Methodology

The purpose of this research is to apply its results to improve the level of supply chain agility of automobile companies and is descriptive and correlation type in terms of research method. In this research, the statistical population consisted of 515 managers of parts suppliers of SGSC. In this research, the Cochran formula was used to determine the sample size. Therefore, 220 managers parts suppliers of SGSC (by random sampling method) were selected. In this study, 250 items were distributed and 228 final questionnaires were collected and data was analyzed based on them. The initial data of this research were compiled by researcher made questionnaire adapted from Kim and Chai (2017) and Gligur et al. (2016) models.

Convergent Validity: In this study, the convergent validity was used to determine the validity which is one of the important criteria in determining the fit of measuring models; it examines the correlation of each structure with paper questions (index). An AVE slightly below 0.50 might be acceptable in a really "interesting" if it does not produce major discriminant validity problems the diminished AVE is noted and discussed in the Limitations any significant effects involving the low AVE LV's are held to a higher significance requirement (e.g., |t| >= 2.2 rather than |t| >= 2.0), and 4) any discussion of interpretation, and especially implications, involving the low AVE LV's are clearly labeled as "very provisional" and in need of replication.

Reliability: In this study , Cronbach's Alpha coefficient was used to determine the reliability.. Convergent validity and Cronbach's Alpha results are presented in table (1).

Table 1. Convergent validity and Cronbach's alpha coefficient

Variables	**Cronbach's Alpha**	**AVE**
Supply chain orientation	0.782	0.663
Production of information	0.882	0.685
Information dissemination	0.726	0.722
Response to the information	0.774	0.804
Environmental uncertainty	0.769	0.839
Company Supply Chain Agility	0.733	0.556
Supplier innovation	0.798	0.637
Green supply chain sharing information	0.772	0.728
Strategic resources	0.786	0.593

According to Table (1), the reliability of the tool has been approved, and the convergent validity is confirmed by a value higher than 0.5. In this research, correlation test and structural equation modeling (SEM) tests were used to analyze the data by LISREL software. In addition, it is important to examine direct effects as compared with indirect effects, which the VAF [1] test was examined for this purpose. To determine the intensity of the indirect effect by an intermediate variable, VAF was employed. Using this criterion, the ratio of indirect effect to total effect is calculated. The amount of VAF is calculated from the equation 1:

[1] Variance Accounted For

$$VAF = \frac{a \times b}{(a \times b) + c} \quad (1)$$

Formula Assumptions:
A: The value of the path coefficient between the independent variable and the mediator.
B: The value of the path coefficient between the mediator and dependent variables.
C: The value of the path coefficient between independent and dependent variables.

4. Findings

The results of the descriptive analysis of the variables and the Kolmogorov–Smirnov test are presented in Table (2) .

Table 2. Descriptive analysis of research variables (n = 228)

	Mean	**Standard Deviation**	**Minimum**	**Maximum**	**KS**
Supply chain orientation	3.345	0.754	1.091	5.000	0.000
Information production (market orientation)	3.313	0.827	1.000	5.000	0.000
Information dissemination (market orientation)	3.633	0.837	1.000	5.000	0.000
Response to information (market orientation)	3.471	0.870	1.000	5.000	0.000
Environmental uncertainty	3.305	0.860	1.000	5.000	0.000
Company Supply Chain Agility	3.399	0.681	1.714	5.000	0.009
Supplier innovation	3.528	0.632	1.875	5.000	0.007
Green supply chain sharing information	3.496	0.587	1.909	5.000	0.085
Strategic resources	3.283	0.874	1.000	5.000	0.000

Descriptive analysis results confirm the appropriateness of supply chain agility and the set of factors that affect it. the value is larger than the mean (3) in all variables (considering the use of the Likert spectrum in this research, the numerical value of 3 is considered as a standard or mean value in the range of 1 to 5). As shown in Table (2), the level of significance of the test is less than the mean value of 0.05 ($p < 0.05$). Therefore, nonparametric tests were used. The results of the correlation coefficient between the variables of the model are reported in Table (3).

Table 3. Correlation coefficients between variables

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Supply chain orientation	1								
Information production (market orientation)	.685**	1							
Information dissemination (market orientation)	.604**	.679**	1						
Response to information (market orientation)	.640**	.593**	.692**	1					
Environmental uncertainty	.698**	.841**	.653**	.691**	1				
Company Supply Chain Agility	.639**	.754**	.699**	.676**	.740**	1			
Supplier innovation	.590**	.563**	.438**	.518**	.554**	.597**	1		
Green supply chain sharing information	.672**	.680**	.658**	.687**	.752**	.750**	.750**	1	
Strategic resources	.705**	.643**	.589**	.694**	.614**	.701**	.508**	.605**	1

** Significance at 99% confidence level

Considering the significance level of the test, it is determined that there is a significant relationship between the model variables ($P < 0.01$). Results show that there is a significant positive correlation between the variables. In the following, structural equation modeling was used to answer the research hypotheses. Accordingly, in the first step, the factor loadings were studied and the structural research model was investigated. The results of factor loadings and significant numbers are presented in Table (4).

According to the results presented in Table (4), in all cases, the coefficients of the factor loadings are greater than 0.4 which indicates the suitable fit of the measuring models. Also, significant coefficients with a value above 1.96 confirmed the significance of factor loadings' coefficients. The findings confirm that all structures of this study have been well-fitted. Accordingly, in the following, a structural model is studied in which the coefficients are determined and the path coefficients are presented (Fig. 2).For this part of research, we used LISREL9 to run the model.

Table 4. Factor loadings and significant numbers for each research structure

Variables	Number of items	value of Factor loading	The value of the significant coefficient
Supplier innovation	8	0.807-.0328	2.135-19.438
Environmental uncertainty	4	0.768-0.817	14.190-20.315
Strategic resources	5	0.731-0.864	11.587-39.284
Information sharing	11	0.345-0.762	2.588-15.485
Supply chain orientation	11	0.587-0.831	7.932-22.206
The market orientation	3	0.871-0.894	28.342-42.756
Supply Chain Agility	14	0.511-0.895	3.600-45.03

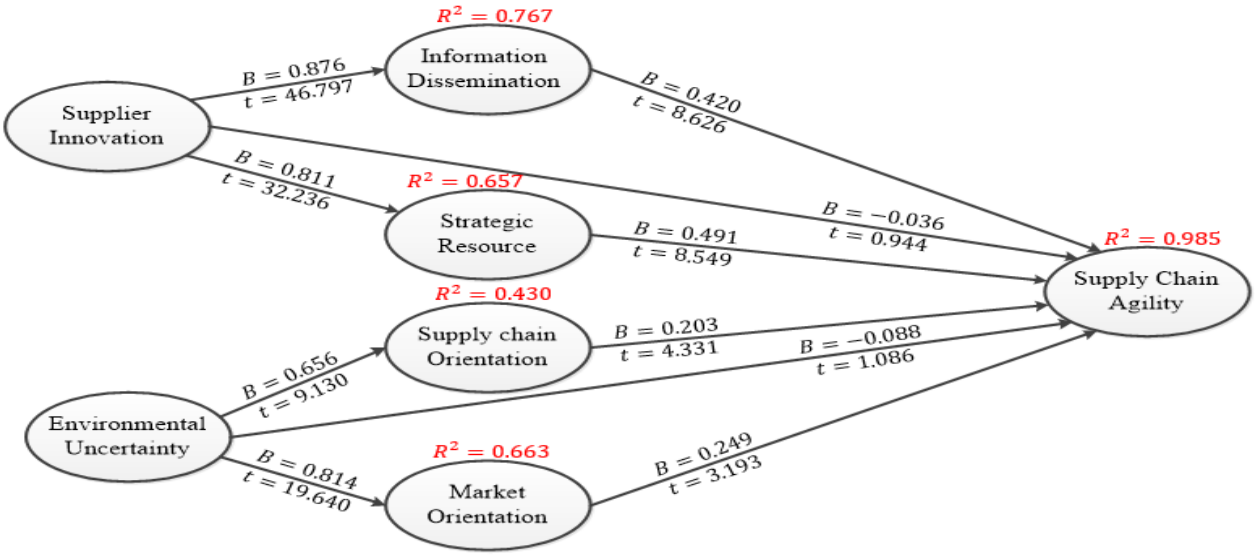

Figure 2. Model of the research, along with regression and t-value coefficients

According to Figure 2, the path coefficients between the main paths in the present research are mapped in accordance with the conceptual model of the research. The findings show that in most of the existing paths, the regression coefficient is higher than 0.4, which indicates the suitability of the variables' influence. (In this case, only two paths have a value less than 0.4).However, the study of significant numbers indicates that regression coefficients have been statistically significant (p> 1.96) in all paths. The results of the research show that all hypotheses are validated.

In addition, the determination coefficients are also presented within the variables affected by other variables. In this regard, according to Fig. 2, it can be concluded that the set of factors that influenced the agility of the supply chain in this model can account for 98% of the variations. Given the value of the coefficient of determination which is greater than 0.33, the fitting of the model presented in this study is confirmed. It can be stated that, the significance coefficient o greater than 1.96 has been observed in all paths of the theoretical model, which confirms the significance of regression coefficients effects. Indirect effects have been measured by using the VAF method.

I. The indirect effect of supplier innovation with agility

A) With the mediating variable of information sharing

The findings confirm that information sharing plays an appropriate mediator role (VAF> 0.5) in the relationship of supplier innovation and supply chain agility.

$$VAF = \frac{0.876 \times 0.420}{(0.876 \times 0.420) + 0.036} = 0.910$$

B) With the mediating variable of strategic resources

$$VAF = \frac{0.811 \times 0.491}{(0.811 \times 0.491) + 0.036} = 0.931$$

The findings confirm that strategic resources play an appropriate mediator role (VAF> 0.5) in the relationship of supplier innovation and supply chain agility.

$$VAF = \frac{0.656 \times 0.203}{(0.656 \times 0.203) + 0.088} = 0.652$$

II. The indirect effect of environmental uncertainty with agility

A) With the mediating variable of supply chain orientation

$$VAF = \frac{0.656 \times 0.203}{(0.656 \times 0.203) + 0.088} = 0.652$$

The findings confirm that supply chain orientation play an appropriate mediator role (VAF> 0.5) in the relationship of environmental uncertainty and supply chain agility.

B) With a market-oriented mediating variable

$$VAF = \frac{0.814 \times 0.249}{(0.814 \times 0.249) + 0.088} = 0.697$$

The findings confirm that market orientation play an appropriate mediator role (VAF> 0.5) in the relationship of environmental uncertainty and supply chain agility.

5. Discussion

The main hypothesis in this study was that supplier innovation and environmental uncertainty affect supply chain agility through information sharing, strategic resources, supply chain orientation and market orientation. The findings of this study have fully confirmed this one. The findings of this study are in accordance with the results obtained from Kim and Chai (2017) and Gligor et al. (2016). It can be stated that information sharing, strategic resources, supply chain orientation and market orientation play an important role in the relationship of supplier innovation and environmental uncertainty with supply chain agility. In the following, all hypotheses derived from this hypothesis are discussed and compared.In the first hypothesis, the positive impact of supplier innovation on the agility of the supplier was confirmed. This suggests that the suppliers who implemented innovation in their works have reached to agility in the company. In this regard, Ion and Jane (2014) investigated the effects of two organizational variables (market orientation and organizational innovation) on supply chain agility. Their results indicated that companies with high market orientation and innovation have more agile supply chains, which are consistent with the results obtained in this study. Also results of Kim and Chai(2017) and Golavar (2015)studies are consistent with the results of this hypothesis.

Accordingly, Golavar(2015) has argued that the world and subsequently the management practices are changing and to succeed in a different world, there should be a different management. Agility is one of the important factors that enables the manager to deal with changes more correctly, faster and more effectively, utilize the potential opportunities created by the change in the best way, work to improve the organization and to meet the goals and future needs of the organization and also introduce high-quality products and services in a relatively short period of time, create competition and some kind of market differentiation from a variety of aspects such as cost, quality, delivery time, flexibility, quick response. In this regard, innovative suppliers can have an effect on agility.

The impact of supplier innovation on information sharing was studied in this hypothesis and the results indicate that supplier innovation has a positive and significant effect on information sharing. the results of this study can be compared with the results of Gligur et al. (2016), which reported similar results. Also, Prajogo and Olhager (2012) and Frazier et al. (2009) studied the impact of supplier innovation on information sharing, and concluded that the supplier's innovation has a positive and significant effect on information sharing which is consistent with our results. Prajogo and Olhager (2012) argued tha in organizations that benefit from supplier innovation and information sharing between the supplier and other components of the supply, long-term relationships with the chain partners are encouraged through social norms and trust instead of legal and inflexible contracts, and in such organizations, sharing will be of great importance as a mechanism to create coordination and cooperation with supply chain partners. Kim and Chai (2017) believe that supplier innovation helps manufacturers reduce their response time to market changes. In fact, supplier innovation has a positive effect on promoting information sharing and allows the organization to be more responsive to customer demand.

The results of third hypothesis also showed that supplier innovation has a positive and significant effect on strategic resources. As supplier innovation can affect the strategic supply chain resources. In this regard, Oke et al. (2013) in a research that was based on the effect of supplier innovation on strategic resources stated that the tendency to innovate in the supplier affects on decision making about supply chain strategic resources. Also the findings of Kibbeling et al. (2013) and Myreen (2010) are consistent with the results obtained in this study.

To illustrate, Kibbeling et al. (2013) argue that innovation makes suppliers have great attention in provision of primary resources; therefore, the purchasing and procurement strategy is of great importance and cases such as timely delivery of raw materials, reducing the backwardness of rapid technological changes, sufficient material transportation, sufficient inventory and cost savings are the characteristics of supplier innovation. In the fourth hypothesis, the effect of information sharing on supply chain agility studied and the results showed that information sharing has a positive effect on supply chain agility. In other words, companies that share information will create agility in the supply chain. In line with the findings of this study, Huanga et al. (2012) and Swafford et al. (2008) pointed to the positive effect of information sharing on supply chain agility. Also, Kazazi et al. (2010) reported similar and consistent results with these results.

Huanga et al., (2012) argued that organizations should try to save their time, money and agility by creating direct channels of receiving information between the sales centers and the main office, establishing an electronic portal to obtain information about customer orders and controlling daily sales, making connection between the logistics department and the product development department, coordinating between sales and operation departments, and the most importantly sharing the information. According to Kzazi et al. (2010), establishing a shared information system between the company and suppliers, sharing information between different units, business and electronic procurement development in the supply chain, and using artificial intelligence in decision making are the capabilities of information technology to achieve agility. Findings of the fifth hypothesis indicated that strategic resources have a positive and significant effect on supply chain agility. So, if companies operate strategically in their resources, their supply chain agility also rises. In this regard, Kim and Chai (2017) pointed out a significant relationship between strategic resources and supply chain agility, which is consistent with the results obtained in this study. Also from other studies that are consistent with the results obtained in this study we can refer to the study by Monczka et al. (2015) and Wang (2010); Baghebani (2011).They have reported a significant relationship between strategic sources and supply chain agility in their study.

According to Monczka et al., (2015), one of the areas where managers have focused more is purchasing and resourcing management. In the last decade, purchasing management in the supply chain has been a challenge for major companies, and achieving a global competitive level in supply has become a major need. Therefore, companies must carefully review their purchasing strategy to cover environmental turbulence. In addition, companies must pay attention to the fact that choosing a strategy will affect market competition (Monczka et al., 2015) .Also according to Baghebani (2011), with the growing importance of supply chain agility, buying patterns have a central role that can boost a company from a temporary purchaser to a strategic partner. Having a purchasing strategy can also be effective in increasing the supply management capabilities. With regard to the importance and expansion of supply chain agility in organizations, the importance of targeting the purchases has also doubled. The effect of improving the performance of these two sections is visible on the performance of the organization in a variety of ways, such as reducing inventory, increasing sales, decreasing customer waiting time and many other things that ultimately lead to improve company performance.

The effect of uncertainty on supply chain agility was proposed as the sixth hypothesis in this study .In this regard, Kim and Chai (2017) stated that uncertainty has a positive and significant effect on supply chain agility which is consistent with the results of the present study. The study by Glilgur et al. (2013) also showed similar results in line with these results. Also, similar results were obtained in the study of Nasrallahi et al. (1395). In order to further clarify, Gligour et al. (2013) stated that the changes of social factors that emerge to protect environment, labor productivity expectations and legal pressures are essential to survival of a company, attract enough customers to create a positive and profitable cash flow, which requires a quick response to changes or so-called agility in an environment with uncertainty. The needs of organizations that would like to respond more quickly to the needs of their customers, the changing environment of competition and the increasing complexity of the environment have led to the emergence of agility.

The findings of this hypothesis showed that uncertainty has a positive and significant effect on supply chain orientation. This implies that managers who observe uncertainty have more successful supply chain orientation. In this regard, the results of Gilgor et al. (2016) are consistent with these results. Naini et al. (2011) also referred to similar and consistent results and argued that uncertainty has positive and significant relationship with supply chain orientation. In this regard, Adabi (2014) suggests that building up a chain and trying to increase the benefits of the entire supply chain are essential to survival and success of the current markets. Manufacturers, suppliers, distributors, warehouses, retailers and customers have tried to insure themselves in global markets through building a network of organizations and activities in the form of a supply chain. That is, organizations work together to achieve common goals, they have an optimal supply chain orientation, and the benefits are not shared among the members of the chain so that each component of the chain merely seeks to increase its profit. This will be achieved when the members of the chain can make the necessary coordination. In this case, the only hypothesis for chain success is provided, but it is not enough to guarantee it. Because the current markets are rapidly developing and each chain has strong competitors, which increase options for customers, each chain has several options to choose its members and facilities. It also needs the most appropriate option to succeed and to have more competitive advantages over its competitors.

In this hypothesis, the results indicate that uncertainty has a positive and significant effect on the firm's market orientation. In other words, it was found that companies with uncertainty have a positive effect on their market orientation. In this regard, the findings of Kim and Chai, (2017), Gligor et al. (2016), Kumar et al. (2011) studies is consistent with the results of this study which indicate uncertainty has positive effect on company's market orientation.

To further understand this hypothesis, Narver and Slater (2000) believe that environment in which modern companies are located is an environment of complexity and uncertainty. Customers are increasingly pushing companies to produce better products and services, and companies must place their customers and their needs and wants at the center of their business and attention in order to gain competitive advantage and success in this turbulent environment because today business environment is heavily influenced by the competition between companies and the rapid technological changes and the continuous change in the demands and needs of customers.The market-oriented approach contributes to the real implementation of this concept. Therefore, it can be said that market orientation lies in the concept of marketing. Market orientation is concerned because with increasing competition among manufacturers, uncertainty rises, and the market orientation puts customers at the center of attention and seeks to create a superior value for them. The market orientation considers to create a superior value for customers, competitors and their strengths and weaknesses as well as inter-tasking coordination. Market-oriented companies have a competitive advantage in responding quickly to the needs of the market and customers in today's turbulent market. Also, the above mentioned hypothesis stated that the supply chain orientation has a positive and significant effect on the supply chain agility . Accordingly, Mehrabani and Hassanzadeh (1394); Gligor et al. (2016) and Naini et al. (2015) are consistent with the results of this research .They have reported a positive relationship between supply chain orientation and supply chain agility in their studies.

Mehrabani and Hasanzadeh (2015) stated that:Companies should pay a lot of attention to supply chain orientation in order to manage the relationship with the main supplier, because this will lead to create relationship management with the main supplier and also companies gain better performance outcomes and expand the supply chain view by creating a supply chain orientation. Gligor et al. (2016) also argued that supply chain orientation can improve strategic resources and company competition and possibly leads to improving agility of the company's supply chain. The tenth and the last hypothesis in this study were to examine the effect of company's market orientation on supply chain agility. The results showed that market orientation has a significant effect on supply chain agility. Kim et al. (2017) showed similar results. Qrunfleh and Tarafdar (2013) and Rajavi (2009) were consistent with these results.

Qrunfleh, and Tarafdar (2013) have stated that under certain environmental conditions, market orientation may have a little effect on the company's performance and be more influential under other environmental conditions. Companies with market-oriented behaviors consider the needs expressed by customers in the market and try to make goods and provide services that can meet those needs. Market-oriented companies increase their awareness of their customers' needs and wants by evaluating them and can provide new products and services in line with the market and the customer. Thus, the need to new approaches is felt, agility being one. In this way, one of the most important factors in winning the competition is the promotion of supply chain agility. When an industrial organization is competitive that has powerful and competitive components and agility together. That is, the company supply chain must have competitive suppliers with globally competitive capabilities and also a chain with agility concepts.

6. Suggestion for Future Research

We suggest for future studies to focus on the uncertainty in the closed loop supply chain or the le-agile are more extensive studies and the innovation factor is considered as an independent variable to know how it can be increase performance of SCM. On the other hand, we suggest considering the role of flexibility of innovation in forward and reverse supply chain.

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Appendix 1.

Very strong	strong	Medium	Low	Very Low	Questionnaire questions in Sazeh Gostar Saipa Company (SGSC)	Dimension		
					Our objectives are consistent with those of our suppliers	Supply chain orientation		1
					Our organization places a high priority on maintaining relationships with our key supply chain members			2
					We trust our key supply chain members			3
					We believe our supply chain members must work together to be successful			4
					Our top managers reinforce the need for sharing valuable information with our supply chain members			5
					We view our supply chain as a value added piece of our business			6
					Our organization recognizes the strategic importance of managing its supply chain			7
					Our organization recognizes the strategic importance of coordinating business functions *within our firm*			8
					Our organization recognizes the strategic importance of coordinating business functions *across firms* within the supply chain			9
					Our organization recognizes the strategic importance of integrating *inter-firm processes*			10
					Our organization recognizes the strategic importance of integrating *intra-firm processes*			11
					We periodically review the likely effect of changes in our business environment	Intelligence dissemination	Market Orientation	12
					In this business unit, we frequently collect and evaluate general macroeconomic information (e.g., interest rate, exchange rate, GDP, industry growth rate, inflation rate).			13
					In this business unit, we collect and evaluate information concerning general social trends (e.g., environmental consciousness, emerging lifestyles) that might affect our business.			14
					In this business unit, we spend time with our suppliers to learn more about various aspects of their business (e.g., manufacturing process, industry practices, clientele).			15
					We have cross-functional meetings very often to discuss market trends and developments (e.g., customers, competition, suppliers)	Intelligence generation		16
					Technical people in this business unit spend a lot of time-sharing information about technology for new products with other departments			17
					Market information spreads quickly through all levels in this business unit			18
					For one reason or another, we tend to ignore changes in our customers' product or service needs	Response to intelligence		19
					The product lines we sell depend more on internal politics than real market needs			20
					We tend to take longer than our competitors to respond to a change in regulatory Min et al. 2007 policy			21
					As compared to other industries, our industry has a higher capacity for growth	Environmental Uncertainty		22
					Our industry is more complex to operate in as compared to other industries			23
					Competition is ever changing in our market			24
					The technology in our industry is changing rapidly			25
					We can quickly detect changes in our environment	Firm Supply Chain Agility		26
					Our firm can promptly identify opportunities in its environment			27
					My organization can rapidly sense threats in its environment			28
					We always receive the information we demand from our suppliers			29
					We always obtain the information we request from our customers			30
					My company can make resolute decisions to deal with changes in its environment.			31

Very strong	strong	Medium	Low	Very Low	Questionnaire questions in Sazeh Gostar Saipa Company (SGSC)	Dimension	
					We can make definite decisions to address opportunities in our environment.	Firm Supply Chain Agility	32
					My organization can make firm decisions to respond to threats in its environment.		33
					My firm can quickly respond to changes in the business environment.		34
					We can rapidly address opportunities in our environment		35
					We can swiftly deal with threats in our environment		36
					When needed, we can adjust our supply chain operations to the extent necessary to execute our decisions.		37
					My firm can increase its short-term capacity as needed		38
					We can adjust the specification of orders as requested by our customers		39
					In introducing new products and services, our company has been the pioneer in many cases	Supplier innovation	40
					Our company, as a supplier, has been more creative than its rivals over the past five years		41
					Our company, as a supplier, is actively working to provide product innovation		42
					Our company, as a supplier, is always a step ahead of our competitors in introducing new and useful products.		43
					Our company, as a supplier, continuously improves its processes		44
					Our company, as a supplier, is more responsive to market changes than its rivals		45
					Our company has been rapidly adopting new management practices over the past five years		46
					If we cannot solve a problem in the usual way, we will be creative and innovative.		47
					Many information systems integrated throughout the supply chain in our company.	Share information in the supply chain	48
					Applications and information sharing within our company are highly integr		49
					There are enough information systems to communicate with customers		50
					There are enough information systems to communicate with other suppliers		51
					Current information systems meet supply chain communications		52
					Regular communications occur between chain members		53
					The desire to share information among members of the supply chain is high		54
					There are functional combination teams in our company (operational teams composed of different specialists).		55
					There is a sharing of technical expertise with other suppliers		56
					In order to improve the supply of products and better quality, the information is gathered through our customers		57
					In our company, supply chain teams are composed of different members.		58
					Currently, the topic of purchase is included as an important process in the strategic planning of the company	Strategic resources	59
					Our purchasing department (Sazeh Gostar) has enough knowledge and information about strategic goals		60
					The purchasing department is considered an important part of the organization's breakthrough		61
					The purchasing department has a special focus on competitive strategies		62
					The company takes into account the consistency and integrity of the components in its purchases (matching parts with other past components).		63