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Investigate the effect of agility capabilities in the automotive industry supply chain network (Case Study: Sapko parts supply network)

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ABSTRACT

Nowadays, supply chain management is raised as one of the infrastructural foundations of implementation the businesses in the world. Formally supply chain is an integrated process that the raw materials were converted into finished products and then are delivered to customers. The aim of this study is to investigate the rate of effect the agility capabilities on agility of Sapko parts of supply network. The used method is descriptive - survey method in this research that for this purpose with the use of questionnaire of collected data and for test the hypotheses was used structural equation modeling technique by using Lisrel software. The statistical population including senior managers and experts of Sapco that was used in terms of data and information needed in the period of 2011 to 2014. 220 persons were determined as a studied sample by using the Kocaran formulate. The results show that components of consciousness, accessibility, decisiveness, flexibility and speed have a significant impact on agility of supply chain network. So the impact of all of the research components was confirmed.

KEYWORDS
capabilities of agility - the supply chain - structural equations

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Introduction

One of the main components that ensure the survival of organizations in today competitive field is change. Organizations specify their positions among the competitors and customers with updated and fit changes. On the other hand production also always had been about to change. This change is changing from manual production to mass production, then to lean manufacturing and to agile manufacturing in the current era. Agile production has attracted more and more attention by the artisans. Therefore, to survive in today changing environment must become agile to be able to survive in front of the environmental changes.

In fact, agility can be described as the integration of organization and individuals with high knowledge and skill and advanced technologies to achieve innovation and cooperation in response to customer needs. It should be evaluated the status of agility in different parts of the company, thereby directors aware of the state of enterprise and able to adopt appropriate decisions (Agrell et al., 2013). However, still most of the Iranian companies have not been able to fully take step to promote and develop their supply networks; this research tries to investigate the capabilities of agility in supply chain network of parts by considering the determined objectives as studied sample in SAPCO Company.

Theoretical foundations and research background

Agile manufacturing

In the 1990s agile manufacturing was introduced as a strategy in response to the business challenges until companies can improve their productive performance by utilizing it as a competitive strategy. Since then, numerous studies conducted on agile manufacturing and was tried to provide practical ways to achieve agility manufacturing. In the nearest research to the issue of study the effects of agile production capabilities on productive performance, Ren and colleagues have investigated the effects of agile production features on competitive priorities with neural network approach. The methodology used in their research does not recognize cause and effect relationships but also shows the power of relation between variables of different layers together.

Also have not considered the relationships between the characteristics of agility and precedence of some than others ;so this study can fill the empty place of field research with an approach to causal modeling and the effect of agility capabilities on performance of the organization, about the effects of agility capabilities on productive performance of the organization and its causal approach helps to the identification of causal relationships between different variables of agility capabilities and productive performance (Ren et al., 2003). Productive performance includes the product quality and flexibility based on the review the articles of Jayaram et al, Joshi et al., Devaraj and et al are defined such as:

1) The product quality can be defined as adaption of product with desired characteristics to customer that reflects in two dimensions of production, according to customer requirements and provide final product with his/her desired characteristics.

2) Flexibility in volume of production is the ability of organization to increase or decrease the volume of production according to customer demand, without high time-consuming and cost shock (saremi and Ezhdari, 2009).

Achieving the agility in the form of four agile strategy constructs, agile processes, agile links, and agile staff have been identified as follows:

1. Agile Strategy: It includes the processes of understanding of company and of its position in the field of activity and conformity with the accelerating market, commitment of senior managers to achieve agility and use all employees in this direction and evaluate it
2. Processes of agility: the provision of facilities and processes that are required to agility function of organization
3. Agile links: close collaboration with customers and suppliers and partners and learning from outside the company
4. Agile people: the development of a multi-skilled and flexible workforce and create a culture that makes possible the initiative, creativity and support for effort across the organization (Meredith and Francis, 2000)

Supply chain and its management

Supply chain includes all activities related to the flow and transfer of goods from the phase of raw materials to deliver the product to final consumer and the information flows related to it (Agrl et al., 2013). Supply chain management means the integrating these activities through improving the relationships of chain to achieve sustainable competitive advantage.

The main objective of activities related to supply chain management is to satisfy demand of customers, so that can deliver a desired product with maximum quality, minimum price and at desired time to customers. In order to optimize processes within the chain, each member shall be coordinated with other members of the chain. Studies show that supply chain management is reliable through improvement in relations to achieve competitive advantage (Bratic, 2011).

Supply chain management finally aims to improve organizational performance in the following dimensions:

1. Strategic partnership with supplier
2. Relationship with customer
3. The level of information sharing
4. Quality of information sharing
5. Supersedure (Li& et al., 2006)

Agility capabilities in the supply chain

Consciousness

Consciousness has been defined as the ability to quickly identify the changes, opportunities and threats of kinds of fields in basic military and social sciences, as well as business.

In exercise science, Shepard and Yang (2006), describe the Consciousness as a general and quick movement with change in speed or direction in response to stimulus in whole body, but Farrow et al. (2005), define agility in the form of basic movements that it is necessary that player performs to carry out sudden changes in direction of the body. The ability of the player in the execution of

duties of agility is considered dependent on factors such as visual scanning techniques, speed of visual scanning, visual processing, perception and expectation for future events.

These factors appear in the field agility of player. It has been suggested that elite players differ from normal players in terms of their abilities in expecting the opponent's movements. Some agility tests show that high-performance sports players cause a change in the direction of movement before that the opponent's ball is released, due to the expectation that they have of opponent's movement.

Visual search and expected search also have shown that skilled athletes are able to successfully predict the action of the opponent before it is performed. National protocol for evaluating the performance of agility in athletes of team sports also refers to the role of Consciousness and suggests that the ability of the athletes in the successful application of agile maneuvers in real game depends on factors such as visual processing, timing, reaction time, perception and expectation. Conceptualization has been introduced a variety of Consciousness until now in military science. Decker (1999) looks at agility as the ability to perceive a leading threat and respond quickly to it, but Army of America define very simply agility as the ability of friend powers to act faster than the enemy.

It has been suggested that creating an agile military force requires an acceleration of the so-called ring of OODA (observation, orientation, decision making, and act). The concept of a ring of OODA is presented by USAF military strategist, Colonel John Boyd and originally it is used in the operational and strategic levels combat operations.

Dimension of the agility Consciousness is located in the stages of observation and orientation of this ring and is considered a prerequisite for an agile and fast reply. Some scholars of military sciences look at the capacity of Consciousness as situational awareness level and introduce it according to time and place, as an understanding of environmental components. The speed of identify the environmental components are known very sensitive. In the scene of the battle, military forces must be aware of the leading threats. Identify changes faster and give faster response to them. Dimension of the Consciousness has been in the center of attention of business agility researches. Sharifi and Zhang (1999) have concluded that agile organizations need to have a basic agility that includes feel, get up, and an expectation of changes in the business environment.

Zhang and Sharifi (2000) divide capacities of agility into four main categories: responsiveness (ability to identify, respond and recover from changes at high speed, in the form of passive or active), competence (the ability to run effectively and efficiently the goals of trade corporate), flexibility (the ability to run various processes and use different features in order to achieve the same objectives) and speed.

Although some possible aspects describe agility, but conceptualization of Zhang and Sharifi (2000) is problematic. One of the limitations of this

conceptualization is the lack of distinction between the ability to detect changes and the ability to respond to changes.

These two distinctive capacities under a category are considered as accountability. In other researches, study of Zhang and Sharifi (2000) extends and considers Consciousness as distinct dimension from agility. Other articles have found the role of Consciousness in the design of agile manufacturing systems. The role of Consciousness in achieving the desired level of agility is emphasized in information systems and researches of development field of information systems. Sarker and Sarker (2009) believe that agility is defined in environmental scan and giving meaning trends to expect events and identify impending and possible crises, but other researchers emphasize on the important role of sensing the opportunities and threats of the market.

Christopher (2000) was the first one that confirmed that for being agile in fact, a supply chain must have the ability to read and respond to actual demand in supply chain management studies. He refers to this capability as market sensitive. One limitation of the interpretation of Christopher (2000) is that although he points out the importance of understanding customer needs, but he does not conceptualize it as a distinct capacity, he puts it in the same batch that respond to capacity of actual demand is in it.

Another shortcoming of the study of Christopher (2000) it is only points to the importance of understanding of demand information, regardless of supply and security. The other researchers of supply chain field also point out that agility requires a real awareness level of the changes and adapt to the sensitivity of market introduced by Christopher.

However, Lin and colleagues (2008) were the first persons who conceptualized Consciousness as a distinct dimension of the agility of supply chain. The researchers believe that supply chain agility must be vigilant to changes within supply chain and the surrounding environment. This dimension of agility is raised by sensing the emerging trends in the marketplace; listen to customer and monitoring real demand due to data of points-off sales of the product.

Access

Accessibility, after reviewing the papers was determined as the second dimension of supply chain agility in business enterprises. Access to supply chain information is known as one of the key requirement of supply chain agility.

Christopher (2000) in his entrepreneurial idea article says that agile supply chains must have several characteristics. Agile supply chains should be virtual, in other words, they should be information -based instead of being inventory-based.

Members of the supply chain should share the moment demand and information related to production. Create virtual supply chains gives the possibility to access to relevant data to all members of the supply chain and makes informed

decisions about how to respond to changes that are identified in the environment.

Lin and colleagues (2006) point to the capacity of access to information as integrate the information and describe it the ability to use information technology to share data between buyers and suppliers. Information integration can be considered as an infrastructure needed to create a virtual supply chain. Researches in the field of construction and production suggest that the need to design agility means creating an environment than relevant information can be accessed in it. Goldman et al. 1995 know forming a virtual partnership as one of the four basic principles of agility.

This view is supported with other articles in the field of manufacturing and production research that virtual businesses, ICT knows as key factors in creating the agility. Information systems and researches of development of information systems provide as well as many empirical evidences to consider information integration as a key factor in creating the agility. The high level of integration provides the possibility to collect and share accurate information. Instantaneous accessibility to information enable supply chain members, for rapid identification of changes in the needs of customers.

Schifer (2006) considers the ability to provide an agile matched response to collect and efficient distribution the information. This view is also confirmed by Atkinson and Moffat (2005) also believe that the accessibility of information is one of the necessary conditions for the existence of agility.

Decisiveness

This dimension is defined as the ability of decisively decision-making, Decisiveness is determined as the third dimension of supply chain agility of business enterprises. Researches of sport sciences and military sciences suggest that agility depends on the ability to take decisive decisions by using available information. Researchers of learning engine have found to the role of decision-making in agility of duties. They managed to separate the time of decision-making of players in order to evaluate its contribution in the performance of agility. Time of decision making is measured with the time elapsed between the moment when a stimulus is displayed for the player and the starting movement of player. Researchers control the aspects of Consciousness and accessibility of agility by providing incentives to the players (minimum requirement for identification) and provide information about how to respond to these incentives (limited need for access to information). They have investigated the effect of the decision-making abilities on agility in different fields of sport. Helson and Paolous (1988) showed areal movie of different patterns of practices to beginners and professional persons of football. Participants were asked to respond physically to this film, these reactions should be taken when the ball moves toward them with the intention of scoring, a ball is passed to a member of the group or is passed by a dribble of a player. Simulation showed that skilled players compared to recruit players have high decision-making skills. These

researches show that outstanding performance of free skill sports is ultimately determined based on the efficient decision making skills. The top strikers who show sufficient agility have fantastic decision-making skills in response to the movements and placement the body in front of defenders of opponent.

Researches of Wheeler and Cyrus 2010, have investigated the role of ability to decision making at the time of implementation the duties of agility about rugby. These authors have concluded that exercises of decision-making must be entered in agility training programs.

Their findings with other studies have shown that involving the components of decision making to different levels of agility performance leads in compliance. In Australian football, decision-making is considered as one of the most important factors in the creation of agility, because it helps to the top strikers to successfully pass the dam of oppose

Yang et al (2002) identified two main components of agility in the way of change in direction of speed and decision making factors in their definition of agility. The other procedures of agility conceptualization confirm also the share of abilities in decision-making in agility performance in sports. Also, researchers suggest that, decision-making skills have also importance with the increasing complexity of the task. The increase in complexity effects on the performance of an athlete, this issue can be seen based on weak correlation between the ability in direct running and ability to handle complex tasks of agility. The component of decision-making of agility can help to explain this matter why the direct performance of running (no decision making is needed) has little effect on performance of agility.

Previous researches have observed less than fifty per cent share between reactive agility performance (decision making is needed) and the re-defined agility performance (no decision making is needed). In the area of supply chain, Christopher (2000) makes a clear distinction between speed (meet the demand of customer through shorted time of main delivery) and agility (rapid response to changes in demand in terms of volume and diversity).

Researches in the field of military science point out the importance of decisiveness. Phase of decision making is one of the main components of the ring of OODA. A sequential three-stage process occurs during decision phase: production the options, choose the best option and adapt with the best option.

It has been suggested that the giving speed to the phase of decision making causes more agile response. Review above articles shows that in order to develop supply chain agility, creating abilities to identify fast changes (Consciousness) and access to relevant information on how to deal with changes (accessibility) they are not enough.

Business enterprises must boost their ability to make decisions decisively about how to respond to changes (decisiveness). Agility dimensions together means the Consciousness, accessibility and decisiveness can shape the field of cognitive of agility supply chain. These dimensions are related to the processing of data and

give to the business enterprises ability to determine the measures that need to respond to changes, opportunities and threats that were made in advance.

Speed

After the decision was made about how to respond to changes, business units must be able to quickly implement those decisions. Speed is defined fourth dimension of agility as the ability to run fast the decisions. Researches in the fields of sport science and military sciences have shown that aggressive in creating the proper ground for the creation of agility is very important. Researches on agility training effect on the performance of power of athletes show that agility depends heavily on the speed of athletes in doing the motion.

Numerous sport tests about agility have identified the change in speed of orientation direction as one of the main components of agility. Although Technical terminology may vary between different research papers (for example, being quick, being sharp, sharpness, speed, acceleration), but most of the articles point out to speed as an essential part of agility.

Also, researches of military sciences confirm movement, sharpness (Decker to 2006) and the speed of operation (Alberts 2007; Makeli and et al. 2008) to facilitate the existence the agile response through emphasis on the role of speed. Christopher in the field of business studies (2000) suggests that one of the required capacities in the supply chain agility is speed and defines it as an ability to complete an activity, as quickly as possible.

This ability is known constantly as a key factor to create agility in supply chain management researches. Also in researches of Lin and colleagues (2008, 2009) is referred to the issue of sharpness with this definition: the dimension of capacity of response the agility of supply chain in business enterprises.

Kumar and Motovani (1995) point out to the dimension of speed of agility as the ability of to accelerate actions in critical and sensitive times. Researches in the field of manufacturing and production provide additional evidences to confirm the speed as one of the dimensions of agility. Sharifi and Zhang 1999, say that speed is one of the necessary capacities of an agile organization. They describe speed as the ability to execute tasks and operations in the shortest possible time. Kidd (1994) also says that agile business units move fast and Zhang (2011) considers speed as one of the features of agile business enterprises.

In fact, agility is focused around speed as a business concept. Gonaskaran (1998) introduces the components of speed dimension (for example: rapid formation of partnerships) as key factors of creating agility in one of the most important articles in the field of agile manufacturing and production. An overview of definitions of agility shows that most conceptualizations of this component, consider considerable emphasis on speed.

Flexibility

The fifth dimension of agility of supply chain, flexibility is defined as ability to modify a range of tactics and operations to required limit. Sport science researchers consider flexibility as the key factor of agility.

Asporis et al (2010) refer to the effect of flexibility on agility in their research in the field of education the agility, effect. Researches show that agility performance can be improved the by flexibility training. Military Sciences Researches provide additional verification to consider flexibility as one of the important factors of agility.

This section of articles concludes that the inherent flexibility is required for agile military responses. Also, researches of the scope of the business suggest that a response of business enterprise to changes depends on flexibility of the tactics of its supply chain and its operations. In the field of sport, mobility of joints of athletes (flexibility) controls the interval of fast settings of athlete. The kind of implemented change the direction (agility) depends on the flexibility of certain members of the body that are involved in training. Similarly, supply chain of a business enterprise works in a certain range and agility of supply chain of business enterprise (ie adjust tactics and operations) is limited according to that range.

For example, supply chain of business enterprise cannot produce more items quickly than the capacity of fixed manufacturing and production that allows it. Supply chain agility articles point out to the role of flexibility in providing an agile respons

Empirical researches have realized the positive relationship between logistics and flexibility of manufacturing and production the agility of supply chain. Soaford and colleagues (2006) in their framework consider agility of supply chain as capacity that focus in the external way and is derived of flexibility in supply chain processes (merit with internal focusing).

Researches also show that the flexibility of the supply chain directly effects on the agility of supply chain. Other researchers of supply chain have realized the role of flexibility. Lee and colleagues (2008, 2009) consider the flexibility as main aspect of this structure in their definition of supply chain agility. Similarly, this view finds its confirmation in a number of frameworks of supply chain agility. Flexibility has been considered as one of the key dimensions of agility in the researches of production and manufacture. Agility was expressed as a business concept, for first time in relation to flexible manufacturing systems.

The idea of flexibility of manufacturing and production was extended to a wider scope of business and the concept of agility was born as an organizational features. Agility role in providing agile response has been identified in several definitions of agility. Hung and colleagues (1996) define agility as flexibility and quick response to market demand.

But Ashalatha and colleagues introduce it as a model that has flexibility as well. In one of the famous frameworks in agility of manufacturing and production, Sharifi and Zhang 1999; introduce flexibility as one of the capacities that an agile organization must have it. This view is confirmed by a lot of empirical

research papers in the field of manufacturing and production (Holcomb and Stank, 2013).

Research Questions

According to the mentioned cases, the questions that this study seeks to find answers to them are as follows:

1. How is the effect amount of components "consciousness" on agility of supply chain network?
2. How is the effect amount of components "accessibility" on agility of supply chain network?
3. How is the effect amount of components "decisiveness" on agility of supply chain network?
4. How is the effect amount of components "flexibility" on agility of supply chain network?
5. How is the effect amount of components "Speed" on agility of supply chain network?

The research hypotheses

Five major components as supply chain agility capabilities were determined by using the literature and as well as previous research studies, (including components: Consciousness, accessibility, decisiveness, speed and flexibility) that the rate of their effect on agility of supply network will be studied in following.

1. Investigate the effect amount of component of "Consciousness" on the networking of supply chain.
2. Investigate the effect amount of component of "accessibility" on the networking of supply chain.
3. Investigate the effect amount of component of "decisiveness" on the networking of supply chain.
4. Investigate the effect amount of component of "speed" on the networking of supply chain.
5. Investigate the effect amount of component of 'flexibility' on the networking of supply chain.

Research Methodology

Research Methodology

This study is applied in terms of purpose, from the kind of the degree and importance and the rate of control the variables is field, in terms of data collection is survey and in terms of data analysis method is kind of descriptive. Including methods of data collection can note to library and documentary studies, interview, holding the meetings and intellectual groups, observations and also can use a questionnaire to collect information.

After extracting index is related to the subject of research and in line with confirm the relations of the indexes with the statistical studied population in several stages were invited the experts and managers of automotive industry experience and have performed interviews of them in this area. Measurement tools are divided into two categories of standard and developed by the researcher. After extraction and determination of appropriate index s, with the help of specialists and experts, researcher has attempted to develop a questionnaire. Due to this that were used questionnaire and interview method, the final analysis of the data was performed by using the results of the questionnaire Thus to check the rate of effects of several independent variables on the dependent variable were used the structural equations that are of multivariable regression method, and to implement structural equations also has been used statistical analysis software of Lisrel and in other part has been used single-sample t-test by using SPSS software.

Developed questionnaire was set based on Likert multiple-choice range scored from one to five and based on 5 agility capabilities of supply chain extracted of selection of research that one means the lowest value and 5 means as the highest value.

Table 1. The structure of the research questionnaire and its reliability index

Research variables	**Cronbach's alpha**
Consciousness	767.0
Availability	831.0
decisiveness	771.0
flexibility	848.0
Speed	798.0
The entire questionnaire	948.0

The rate of Cronbach's alpha obtained for all research variables is higher than 0.7, which indicates the desirable reliability of the questionnaire. It should be noted that Cronbach's alpha coefficient range is between 0 and 1 and whatever this coefficient be closer to 1 indicates being more reliable the items of the questionnaire.

Statistical population and sample

Statistical research population includes all managers and experts of supply network of Sopko components. In fact the purpose of sampling is inference values of population based on study the sample of it. In this study, to estimate the sample size was used Kokaran formula to determine the sample size. The sample size has calculated by using the formula of 220 persons.

Research Findings

Demographic analysis of sample (work experience)

As the below image shows people with work experience classes between 10 and 20 years have the most frequency.

Table 2. Distribution of frequency of respondents based on the situation of work experience

work experience	Frequency	Percentage
Under 5 years old	18	8.2%
5 to 10 years old	78	35.5%
10 to 20 years old	101	45.9%
Over 20 years old	23	10.5%
Total	220	100

Demographic analysis of sample (The level of education)

As the following image shows the largest academic group among the respondents is people with Bachelor degree.

Table 3. Distribution of frequency of respondents based on the level of education

Education	Frequency	Percentage
Diploma	33	15%
Associate Degree	29	13.2%
B.Sc.	118	53.6%
MSc	38	17.3%
PhD	2	0.9%
Total	220	100

The results presented in image of distribution of frequency of respondents on the basis of relevant work experience, and education level indicate that the statistical samples of research are among of highly educated people (more than 70% of undergraduate and higher) and as well as those with relevant work

experience high (more than 60% are with relevant work experience more than 10 years).

Test of questions and hypotheses

Factor analysis of the research variables

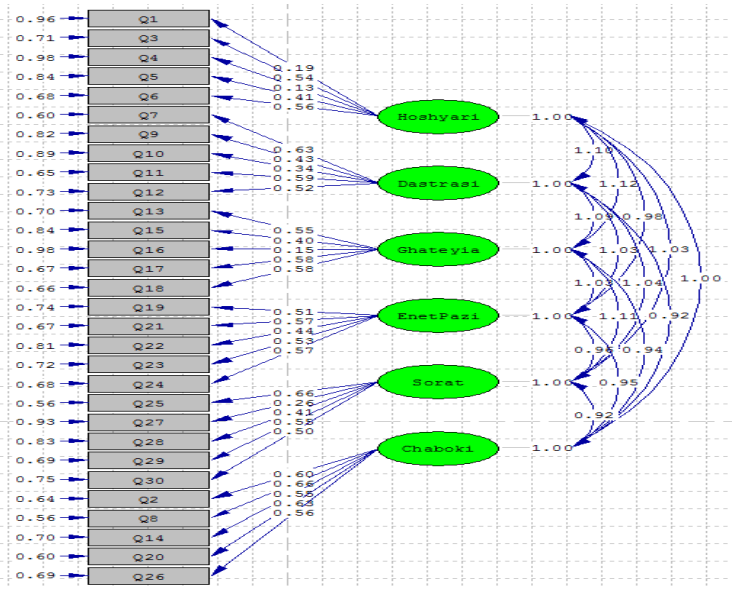

Figure 1. Factor analysis of research variables

Coefficients between research questions and variables are standardized coefficient, which reflects the severity of ability to measure of each index in the research variable. This coefficient is between 0 and 1. And whatever it is closer to 1 indicates higher ability of index in measuring the variable. Coefficients of significant level of model variables are as follows:

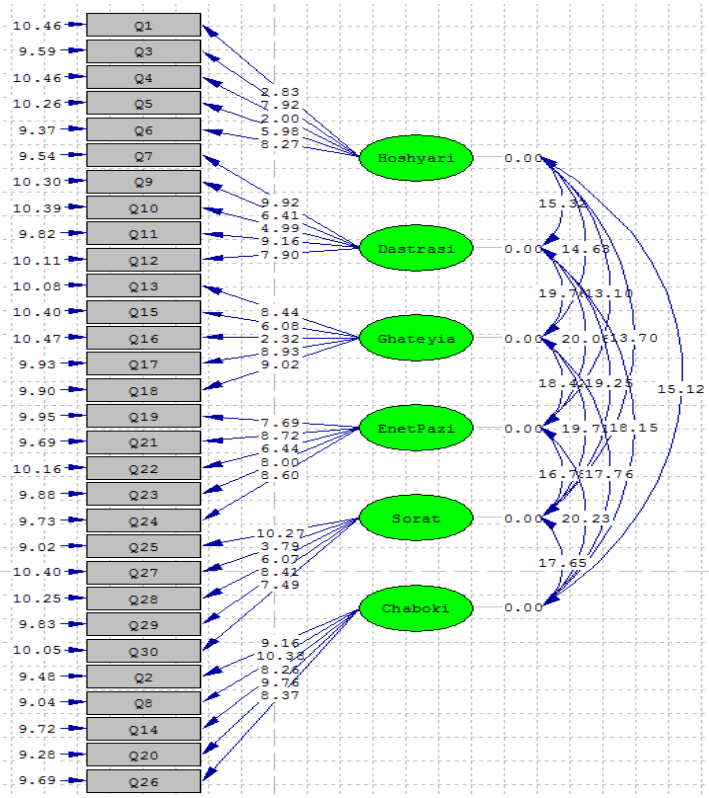

Figure 2. A significance level of research variables

Significant coefficients indicate the significance of relationships between variables. If these coefficients are between -1.96 to 1.96, indicates the lack of ability of index to measure the related variable.

In the following image values of x2 to the degree of freedom RMSEA (Root Mean Square Error of Approximation), CFI (Comparative Fit Index), GFI (Goodness of Fit Index), IFI (Incremental Fit Index) have been stated for each of the studied variables.

Table 4. The results of confirmatory factor analysis

Variables	Load factor	Significant level	Variables	Load factor	Significant level
Consciousness			**Availability**		
Question 1	19.0	83.2	Question 7	63.0	92.9
Question 3	54.0	92.7	Question 9	43.0	41.6
Question 4	13.0	00.2	Question 10	34.0	99.4

Question 5	41.0	98.5	Question 11	59.0	16.9
Question 6	56.0	27.8	Question 12	52.0	9.7
decisiveness			**flexibility**		
Question 13	55.0	44.7	Question 19	51.0	69.7
Question 15	4.0	08.6	Question 21	57.0	72.8
Question 16	15.0	32.2	Question 22	44.0	44.6
Question 17	58.0	93.8	Question 23	53.0	00.8
Question 18	58.0	02.9	Question 24	57.0	6.8
Speed			**Supply Chain Agility**		
Question 25	66.0	27.10	Question 2	6.0	16.9
Question 27	26.0	79.3	Question 8	66.0	38.10
Question 28	41.0	07.6	Question 14	55.0	26.8
Question 29	58.0	41.8	Question 20	63.0	76.9
Question 30	5.0	49.7	Question 26	56.0	37.8
RMSEA = 0.000; X^2/df^1 = 2.96; GFI = 0.91; AGFI = 0.86; CFI = 0.92, IFI=0.92					

LISREL calculates a GFI (Goodness of Fit Index) (the ratio of sum of the squares explained by the model to whole estimated sum of squares of the matrix in population). This index desirability is similar to the correlation coefficient.

Both of these criteria are variable between zero to one, although theoretically may be negative (Of course It should not happen, because indicates the lack of definitive fitting of model with data). Whatever GFI (Goodness of Fit Index) and adjusted Goodness of Fit Index are closer to number one, goodness of fit of model is higher with the observed data.

The value of the square root index of estimation the variance of the error of approximation that actually is the same test of deviation of any degree of freedom, for models that have a good fit, is less than 0.05.RMSEA has been defined as the size of difference for each degree of freedom. Higher values up to 0.08represent a reasonable error for approximation in the population. Models that their indexes of the square root of estimation the variance of the approximation error is 1.0 or more have a poor fit.

The above table shows that confirmatory factor analysis of questionnaire structures had proper fitness and as well as structures of questionnaire show relevant variables well.

Equation modeling of the research model

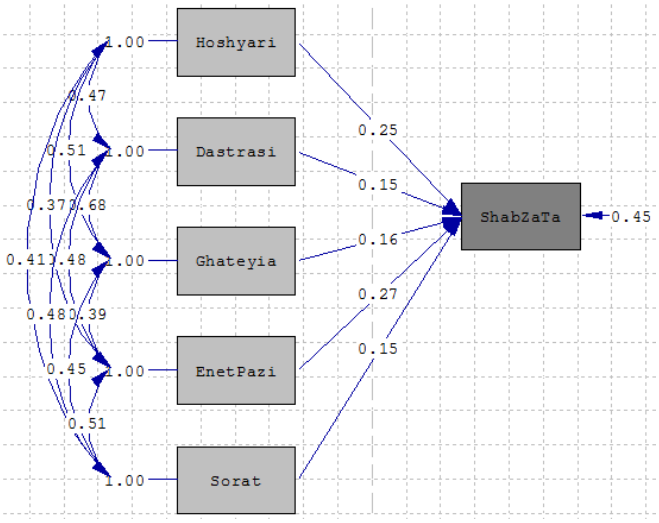

Figure 2. Final research model

As well as the significant relationship between the variables is as follows:

Table 5. The significance of relationships between variables

Relations of concepts with index s in the model	Standardized value	Standard Error	T-value	R2	Significant level	Result
How is the effect amount of components "consciousness" on agility of supply chain network?	25.0	03.0	45.4	55.0	P<0.01	Confirming significant impact
How is the effect amount of components "availability" on agility of supply chain network?	15.0	063.0	22.2	55.0	P<0.05	Confirming significant impact
How is the effect amount of components "decisiveness" on agility of supply chain network?	16.0	035.0	48.2	55.0	P<0.05	Confirming significant impact
How is the effect amount of	27.0	03.0	89.4	55.0	P<0.01	Confirming significant

components "flexibility" on agility of supply chain network?						impact
How is the effect amount of components "Speed" on agility of supply chain network?	15.0	031.0	65.2	55.0	P<0.05	Confirming significant impact

Other values of the final model are observed in the following image:

Table 6. The amounts of the final model

Title of index	Acceptable domain	Value	result
X^2/DF[1]	X2/DF ≤ 3	96.2	**Confirmation of Model**
RMSEA	RMSEA<0.09	000.0	**Confirmation of Model**
GFI	GFI>0.9	93.0	**Confirmation of Model**
AGFI	AGFI>0.85	90.0	**Confirmation of Model**
CFI	CFI>0.90	93.0	**Confirmation of Model**
IFI	IFI>0.90	93.0	**Confirmation of Model**

Standard estimated values of factor loading have calculated by using maximum likelihood method, it has been shown in image 5

These values are calledλ and was used in order to standard estimate the scores of the latent variables in the analysis of structural equation modeling and these amounts are comparable.

Also the amounts of standard estimate error indicate the amount of error in the estimation of factor loadings that smaller values (close to zero) represent the more accurate estimates and smaller confidence intervals.

1. DF (Degree of Freedom)

The values of significant level that are results of dividing the estimate of factor loading on standard error show a significant factor loading estimate (significantly different from factor load with zero).
Values of significant level between -1.96 and 1.96 represent the lack of a significant effect between related latent variables. Values of significant level between 1.96 and 3 indicate a significant effect with more than 95% trust between related latent variables
Values of significant level equal to and greater than 3 indicate a significant effect with more than 99% confidence between related latent variables. So as can be seen in the column of significant level, the effect of variables on each other can be confirmed with more than 99% confidence interval.
Finally column of explained variance represents the amount of explained variance of the relationships between the latent variables. Higher values up to 1 indicate more appropriate relationships between research variables.

Fit the research model (the structural equations)

Fit the model means that the observed variance-covariance matrix or predicted variance-covariance matrix by model should have values close together or so called have fit.
Whatever our values are closer together in two matrixes then the model has more fit. In structural equation modeling can trust to estimations of model that the model is fit enough.
After estimation the parameters of the model, the question that arises is that the extent to which the desired model is consistent with the relevant data? The answer to this question is possible only through the study the fit of model. So, the researcher must ensure of fit of the model subsequent the estimation the parameters and before their interpretation in the analysis of structural equations.
That's why this chapter is dedicated analyzes the different criteria and index s of the fit structural equation model and in addition to express the conditions and characteristics of each of them to explain how to interpret the overall fit, , fit the section of the measurement and fit the structural section of the model.
The purpose of the fit the model is that to what extent a model has consistency and agreement with the relevant data. As it is stated previously in the process of estimation in LISREL a program can be achieved a matrix as implied covariance matrix (estimated statistical covariance matrix) and the extent to which this matrix is closer to the covariance matrix of the population of the sample, the model would have a better fit. This fit in fact shows the proximity rate of matrix S to the implied covariance matrix and this proximity is measured through various methods (Kalantari, 2009: 127-128)

CFI= (Comparative Fit Index)
RMSEA = (Root Mean Square Error of Approximation)

IFI = (Incremental Fit Index)
GFI = (Goodness of fit Index)
AGFI = (Adjusted Goodness of fit Index)

All fit index is used to show that this model has a good fit. Thus, we conclude that the model of research has a high ability to measure the main variables. According to be standard model, findings of LISREL has reliability.

Testing the research questions by using the structural equation model

According to the image (6) analysis results of research hypotheses by using structural equation modeling results is as follows:

First question: How is the effect amount of components "consciousness" on agility of supply chain network?

According to estimation of component standard "consciousness" on the supply chain network that is 0.25 and values of T =4.45 and R=0.55 can be concluded at the significant level of P <0.01, component of "consciousness" has a significant impact on the agility of the supply chain network. So, significant impact of component on the agility of supply chain network is confirmed.

Second question: How is the effect amount of components "availability" on agility of supply chain network?

According to estimation of component standard “availability” on the supply chain network that is 0.15 and values of T =2.22 and R^2=0.55 can be concluded at the significant level of P <0.05, component of “availability " has a significant impact on the agility of the supply chain network. So, significant impact of component on the agility of supply chain network is confirmed.

Third question: How is the effect amount of components "consciousness" on agility of supply chain network?

According to estimation of component standard “decisiveness” on the supply chain network that is 0.16 and values of T =2.48 and R^2=0.55 can be concluded at the significant level of P <0.05, component of “decisiveness " has a significant impact on the agility of the supply chain network. So, significant impact of component on the agility of supply chain network is confirmed.

Fourth question: How is the effect amount of components “flexibility “on agility of supply chain network?

According to estimation of component standard “flexibility” on the supply chain network that is 0.27 and values of T =4.89 and R^2=0.55 can be concluded at the significant level of P <0.01, component of “flexibility " has a significant impact on the agility of the supply chain network. So, significant impact of component on the agility of supply chain network is confirmed.

Fifth question: How is the effect amount of components “speed “on agility of supply chain network?

According to estimation of component standard “speed” on the supply chain network that is 0.15 and values of T =2.65 and R^2=0.55 can be concluded at the significant level of P <0.05, component of “speed " has a significant impact on the agility of the supply chain network. So, significant impact of component on the agility of supply chain network is confirmed.

Discussion and Conclusion

Conclusions based on structural equations

Conclusion of the first question:

How is the effect amount of components "consciousness" on agility of supply chain network?

The first condition is amount of standardized mean square error in accordance with any statistical test whatever the error rate be reported less, results obtained is closer to the anticipated results and related proposed model is more acceptable.

In examining the amount of resulting error (standardized: 0.03) due to being lower of error rate from 0.1, the first condition is established for acceptance of the model. In the second condition the statistic value desired has been located in the acceptable range and larger than +1.96, positivity of this statistic shows the effect of component of "consciousness" on agility of supply chain network in a positive direction. The third condition also returns to index s of model fitting, this index s should be at optimal level that all these index is also are at optimal level and the third condition is also established.

Conclusion of the second question:

How is the effect amount of components “availability “on agility of supply chain network?

The first condition is amount of standardized mean square error in accordance with any statistical test whatever the error rate be reported less, results obtained is closer to the anticipated results and related proposed model is more acceptable.

In examining the amount of resulting error (0.06) due to being lower of error rate from 0.1, the first condition is established for acceptance of the model. In the second condition the statistic value desired has been located in the acceptable range and larger than +1.96, positivity of this statistic shows the effect of component of “availability “on agility of supply chain network in a positive direction. The third condition also returns to index s of model fitting, this index s should be at optimal level that all these index is also are at optimal level and the third condition is also established.

Conclusion of the third question:

How is the effect amount of components “decisiveness “on agility of supply chain network?

The first condition is amount of standardized mean square error in accordance with any statistical test whatever the error rate be reported less, results obtained is closer to the anticipated results and related proposed model is more acceptable.

In examining the amount of resulting error (0.03) due to being lower of error rate from 0.1, the first condition is established for acceptance of the model. In the second condition the statistic value desired has been located in the acceptable range and larger than +1.96, positivity of this statistic shows the effect of component of “decisiveness “on agility of supply chain network in a positive direction. The third condition also returns to index s of model fitting, this index s should be at optimal level that these entire index also are at optimal level and the third condition is also established.

Conclusion of the fourth question:

How is the effect amount of components “flexibility “on agility of supply chain network?

The first condition is amount of standardized mean square error in accordance with any statistical test whatever the error rate be reported less, results obtained is closer to the anticipated results and related proposed model is more acceptable.

In examining the amount of resulting error (0.03) due to being lower of error rate from 0.1, the first condition is established for acceptance of the model. In the second condition the statistic value desired has been located in the acceptable range and larger than +1.96, positivity of this statistic shows the effect of component of “flexibility “on agility of supply chain network in a positive direction. The third condition also returns to index s of model fitting, this index s should be at optimal level that all these index is also are at optimal level and the third condition is also established.

Conclusion of the fifth question:

How is the effect amount of components “speed “on agility of supply chain network?

The first condition is amount of standardized mean square error in accordance with any statistical test whatever the error rate be reported less, results obtained is closer to the anticipated results and related proposed model is more acceptable.

In examining the amount of resulting error (0.03) due to being lower of error rate from 0.1, the first condition is established for acceptance of the model. In the second condition the statistic value desired has been located in the

acceptable range and larger than +1.96, positivity of this statistic shows the effect of component of "speed "on agility of supply chain network in a positive direction. The third condition also returns to index s of model fitting, this index s should be at optimal level that all these indexes also are at optimal level and the third condition is also established.

Comparative study of findings

Andalib (2004) determines the success factors of agile organizations in the management of supply chains. Jafarnejad and Darvish (2009) measured the index s of flexibility, responsiveness, speed and competence as the major index s, agility of a chain and identified the limiting factors of agility in the same supply chain.

Mashreghi (2010), using the information technology increases the integrity and resilience among the components of the supply chain and improving establishing communication among them. Meybodi (2013), at the time of study of the relationship between the agile supply chain and competitive advantage of Bahman Company stated that the factors affecting competitive advantage in order of priority are: Cost, competitive strategies, accountability, flexibility, speed and competence. Lee and colleagues (2009) characterizes supply chain agility in terms of six factors: Strategic consciousness, the strategic response capacity, operational consciousness, operational response capacity, multicast consciousness, and multicast response capacity.

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