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Research Article

AN INVESTIGATION ON THE EFFECT OF THE PROCESSES INTEGRITY ON SUPPLY CHAIN AGILITY IN BERJES FOOD COMPANY, GACHSARAN

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ABSTRACT
Agility is an attribute required for organizations to undergo future competitive pressures and achieve competitive advantages. It is, thus, necessary to pay the essential attention to supply chain integrity and agility. The present research studies how the integrity of processes can have impact on supply chain agility in Berjis Food Company. This is a cross-sectional and practical research study which is considered as descriptive in terms of data collection. Practical studies are directed toward practical application of knowledge. Here, the information integrity and the network integrity (two elements of process integrities) are the dependent variable and the supply chain agility is the independent variable. As there is a limited statistical population (all 400 managers, experts, and employees of Berjes Food Company in Gachsaran), experts and specialists who are present in the company are asked to comment. Data were collected by the agility of supply chain questionnaire with Cronbach's coefficient alpha of 72% and the integrity of processes questionnaire with Cronbach's coefficient alpha of 75%. Structural equation modeling (SEM) based on multiple regression was used to test hypotheses. Results revealed that there is a significant correlation between the integrity of processes and the supply chain agility.

Keywords: *Supply ChainIntegrity, Supply Chain Agility and Processes of Supply Chain*

INTRODUCTION
Collaboration between different companies in the supply chain is now a vital element of the chain success. Fast introduction of new products to market reduces the life cycle of available products and the market demand turbulences has increasingly made prediction difficult (Tan *et al.,* 1999). To respond to such changes and other changes and maintain and improve the competitive situation, more attention should be paid to the conditions of companies. Given such matters and due to increased global competition, the need for an integrated supply chain and the strategies of collaboration has constantly grown in last decades (Jaafarnezhad, 2010). The close relation between customers and producers presents opportunities for increasing the precision of demand information which reducing the duration of the product design, the production planning and the nonexistence of inventory. This allows more responsiveness to customers' needs. Global competition and increased customers' expectations have forced producers to more concentrate on the speed of delivery, reliability and flexibility (Flynn and Flynn, 2004). To improve such capabilities, many companies applied the strategies of integrated supply chain. As achieving a larger market share is the companies continuous challenges, this can be achieved by collaboration in the whole supply chain and having agility in innovation, on time delivery, product quality, less cost, etc. (Calantone, 2002).
On the other hand, fast response to customers' needs, difficult competitive conditions of market and raised environmental changes are issues organizations are now facing them. In such environment, organizations can not be traditionally directed or controlled. Organizational agility is, therefore, a vital element for having an effective response to changes and achieving competitive advantages. As organizational successes are not merely gained in such conditions and the supply chain has a big share in this way, the importance of agility in the supply chain is further appeared. Such chain can virtually

respond quickly and effectively to market changes. It is believed that agility is the required attribute for enduring future competitive pressures and achieving competitive advantages (Gligor and Holcomb, 2012).

Food products are of industries in which competition has soared in recent years and most companies try to draw more customers by producing varied products. Considering the integrity and agility of supply chain is necessary in such environments.

According to what mentioned above, the main question is that how process integrities affect the supply chain agility in Berjis Food Company?

Research Literature

Supply Chain

According to Van (2001), one of the most important points in reaching competitive advantage in the modern business world is that organizations should collaborate with suppliers, customers and even competitors to advance their operations. Here, the concept of supply chain is formed.

Stressing on the distinctness of logistic and the supply chain, Sutherland refers to three common but different approaches to supply chain:

1. The supply chain is only another expression of logistics.
2. In addition to logistics, the supply chain also includes other tasks such as purchasing, engineering, producing, marketing, financing, and controlling activities in a single company.
3. The supply chain includes all activities of article 2, at the same time, activities relating to the suppliers' suppliers of companies and the customers' customers of a company which is beyond the traditional activities of companies.

Confirming the third definition, Sutherland adds some other points and suggests the following definition:

"Supply chain is the processes of the life cycle including physical, information, financial and knowledge flow aiming to satisfy the end-users' needs by products and services presented by connected suppliers. In different references, physical, information, financial and knowledge flows are considered as the dimensions of the supply chain. The supply chain is not limited to the physical distributors. Financial and information elements in most supply chains are as important as physical flows (Ayres, 2009).

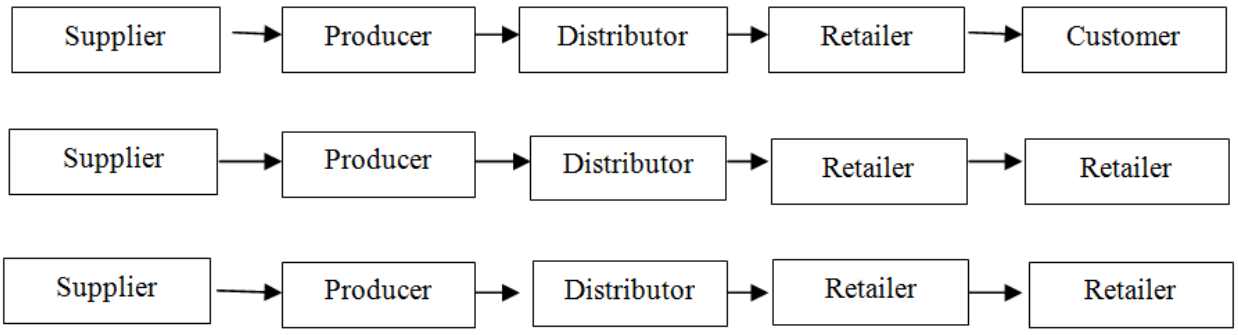

Figure 1: Supply chain network by Chopra and Mindle (2007)

Components of Supply Chain

A. System Input: types of resources organizations need and knowledge relating to the suppliers of organizations;

B. System Processing: operations of production, assembling, and transferring input resources into products;

C. System Output: product distribution (goods and services) and transferring them to customers.

In a supply chain, there are four principle players having a role in the supply chain system:

1. Suppliers: are in the system input;
2. Producers: are in the system processing part; and
3, 4. Distributors and customers: are in the system output.

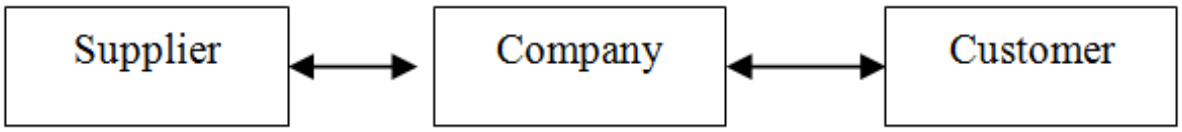

Figure 2: A simple supply chain

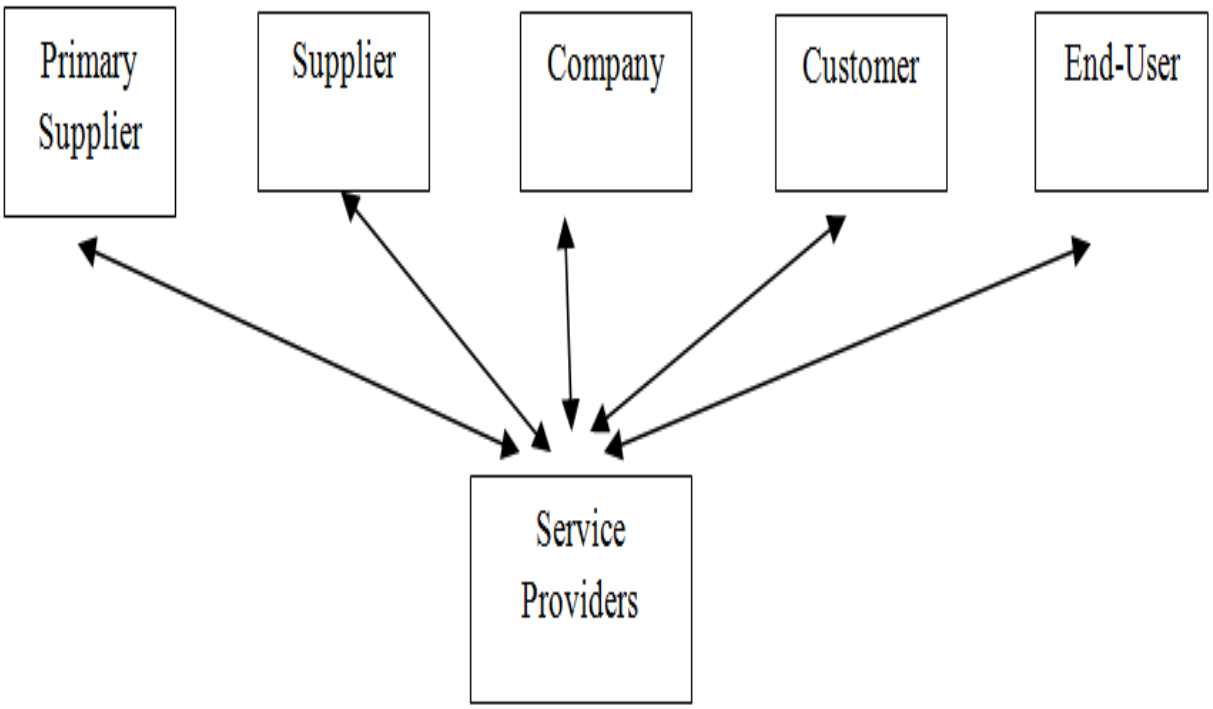

Figure 3: A developed supply chain

Types of Supply Chain

A. Accumulative production for storing: the accumulative production based model of supply chain for storage concentrates on customers' directional demands in real time in order to store inventories. Such accumulated storage is done by an information system which is totally integrated.

B. Continuously storing: the idea of such model is based on refilling the depleted inventories, and directly working with suppliers and or dealers.

C. Customized production: this model is based on customization for assembling immediately after orders. This model requires effectively managing inventories and delivering the required procurements within the supply chain.

D. Channel assembling: by a partial adjustment in customization production, channel assembling is acquired. In this model, different parts of each product are gathered and assembled when they are moving in distribution channel.

E. Global supply chain: a supply chain involving suppliers and/or customers in other countries is known as the global supply chain.

Principles of Supply Chain

1. Planning
2. Supplying resources (procurements)
3. Manufacturing (production)
4. Delivery Management (orders)
5. Feedback (processing references)

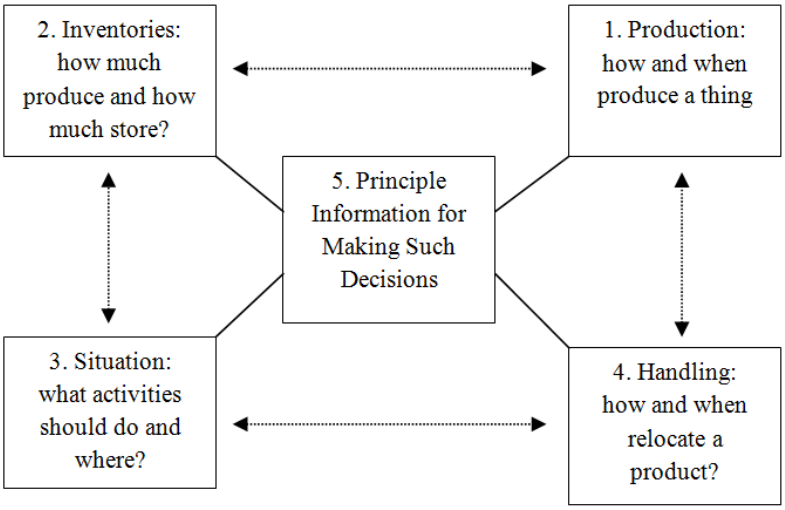

Figure 4: Five major stimuli of supply chain

Difficulties of Supply Chain

Number of decision-making centers: given many organizations are in the supply chain, coordination of it requires high harmony.

Non-coordination: demand prediction is the principle source of the unreliability of the supply chain. Another factor of unreliability is the time of delivery.

Unreliability: such problems occur when a section does not have a good relationship with other sections.

Agility

The concept of agility was first introduced by a number of researchers in Ayokoka institute in Lehigh University (Yaghoubi and Dahmarde, 2010). Agility turned quickly into a major source for studying the production system. This group (Burton Group) defined agility as follows: a production system with magic abilities (local capabilities, soft and rigid technologies, human resources, trained managers, and information) in order to quickly confront varying market needs (speed, flexibility, customers, competitors, suppliers, meta-structure, and responsiveness). This is a system quickly moving between different models of products (responding quickly) or different production lines (flexibility) and ideally and in real-time satisfy customers' needs (customers' needs and demands).

Agile Supply Chain

Agility in supply chain can help organizations achieve their competitive objectives and effectively satisfy their customers' needs in today's competitive environment. The supply chain is one of the main and undeniable factors of organizations' success. Most researchers' believe that having a superior supply chain is a competitive advantage. Commonality in supply chain and the concept of agility develop a new concept called agile supply chain.

To evaluate the agility of supply chains, Zain (2005) presented a framework model based on Goldman's model. The framework includes enriching customers, organizing to create competitive advantages, people and information, and responsiveness.

According to Van (2001), the agile supply chain includes:

1. Sensitivity to customer: agile policy emphasizes on the customer and market.
2. Virtual integrity: agile policy emphasizes on the quick access to demands, quickly interpreting demands and quickly responding them.
3. Integrated network: agile policy emphasizes on communication network.

Observing the attributes of supply chain operations, Van (2005) selected those affecting the supply chain:

1. Proficiency in using and benefiting from speed and flexibility
2. Quickly responding
3. Unique response even in fewer numbers.

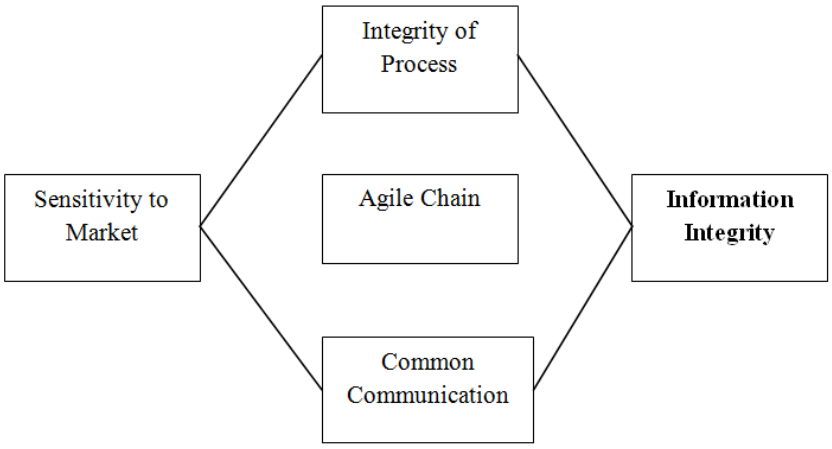

Figure 5: Agile supply chain by Chrostopher

Integrity

A factor that can eliminate this multiple ruptures and pose organizational processes as a competitive advantage is using systems that integrating organizational processes. Business processes can be an important resource for producing competitive advantages and the presence of such multiple ruptures among data and organization processes just results in reducing the efficiency of all members of the supply chain.

Cottrill (1997) showed that the evolution of integrity had changed over time and moved toward a definition in which the supply chain was considered as a cooperation entity extending virtual organizations into traditional organization without any regression. In fact, this is the customers' demand that directs the supply chain by having access to virtual and E-stores. He showed that this tendency created principle changes in many companies directing them toward outsourcing. He also believes that a key point in the implementation is that such changes should be made clear for organizations. The processes should be then extended to approach to customers and suppliers. The main advantages include reducing costs and the time cycle. By coordination and cooperation, Wood (1997) stressed on the unity between functions and objectives. He talked about the weak traditional coordination between goals and production and distribution functions and considered the improvement of such coordination as a chance for more integrity and a precondition for improving and managing the supply chain. Parnell (1998) stated that supply chain integrity occurred when customers and suppliers perceived the close relation between probable goals and results of reduced inventories, shorter production time and better service to customers.

Bowersox and Calantone (1998) argued that understanding an integrated supply chain was not a new thing and because organizations had access to precise, rich and correct information, this integration was possible. They also stated that information was the only element of the supply chain with reduced price over time. Emails are an example in this regard. They are now a tool for communication of organizations and their commercial associates (Lowrence, 1997). They are used with the least cost to send text files, documents, CAD files, spreadsheets, and commercial documents such as orders and information. The wide application of emails is usually ignored in the communication line of supply chain.

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The real ability of information technology for successfully integrating in an abstract phrase has been derived from Christopher: using information technology to share data between buyers and suppliers is making a virtual supply chain. Virtual supply chain is more based on information than on inventories (Christopher, 2000).

Data integrity refers to a large number of databases of organizations to have more coordinated activities. It includes indices such as using codes and standard definition for data, using standard formats for information and data, using standard formats for presenting and exhibition, using concentrated databases, using coordinating systems among data bases, data and informationintegrity.
Network integrity means easily and quickly transferring information in different formats by a set of flexible standards such as fiber, optical cables or satellites. The indices posed in this part include using information network for relating with units and other sections, using information networks for connecting with other databases from different units, using information software packages, using communication networks to share information with other parts, using communication networks for connecting with concentrated databases, using communication networks for facilitating periodical sessions and using network architectures (Shafie and Farsijani, 2012).

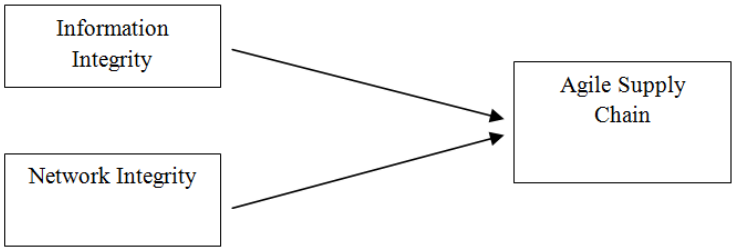

Figure 6: Research conceptual model

MATERIALS AND METHODS

This is a cross-sectional and practical research study which is considered as descriptive in terms of data collection. Practical studies are directed toward practical application of knowledge. Here, the information integrity and the network integrity (two elements of process integrities) are the dependent variable and the supply chain agility is the independent variable.
As there is a limited statistical population (all 400 managers, experts, and employees of Berjes Food Company in Gachsaran), experts and specialists who are present in the company are asked to comment. According to studies, the number of mangers, experts and the company's executives is about 196. So we have:

$$n=\frac{\frac{z^2pq}{d^2}}{1+\frac{1}{N}\left(\frac{Z^2pq}{d^2}-1\right)}=\frac{\frac{(0.95)^2(0.5)(0.5)}{(0.5)^2}}{1+\frac{1}{400}\left(\frac{(0.95)^2(0.5)(0.5)}{(0.5)^2}-1\right)}=196$$

Z = reliability of results ($Z_{\frac{\alpha}{2}}=1.96$)
P = ratio of attributes in the statistical sample (P = 0.5)
P – 1 = ratio of lack of attributes in the statistical sample (P – 1 = 0.5)
D = precision of estimation or the maximum of the acceptable error (ε = 0.05)
Aiming to study the validity of prediction, this research analyzes the correlation of results achieved by questionnaires and the general comments of managers, experts, and employees about the integrity of processes and the supply chain agility. The structural equation modeling (SEM) based on multiple regression was used to test hypotheses.
Regarding the reliability tests and as it is revealed by the alpha values for both groups of respondents and the total alpha, the coefficient alpha for the agility of 30-item supply chain questionnaire was 72% and the coefficient alpha for the 12-item integrity of processes questionnaire was 75%. Thus, the research items are highly valid.

Table 1: Cronbach's alpha for the research variables

Variable	Cronbach's alpha
Supply Chain Agility	0.72
Process Integrity	0.75

Research Hypotheses

Leading Hypothesis

The supply chains integrity has impact on the supply chain agility in Berjes Food Company.

Secondary Hypotheses

1. The information integrity has impact on the supply chain agility in Berjes Food Company.
2. The network integrity has impact on the supply chain agility in Berjes Food Company.

RESULTS AND DISCUSSION

First Hypothesis

There is a correlation between supply chains integrity and the supply chain agility in Berjes Food Company.

Table 2: Pearson correlation results on the relation between the supply chains integrity and the supply chain agility

Variable	Frequency	Correlation	Significance
supply chains integrity	225	0.222	0.001

As observed in table 2, the Pearson coefficient shows the correlation between supply chain integrity and supply chain agility. The significance level of two variables is 0.002 which is less than 0.05. The hypothesis is then confirmed. The correlation coefficient is 0.222 and positive. This means that there is a positive correlation between two variables. Put it differently, the more integrity between the processes of the supply chain, the more agile the supply chain would be.

Second Hypothesis

There is a correlation between the information integrity and the supply chain agility in Berjes Food Company.

Table 3: Pearson correlation results on the relation between the supply chains integrity and the supply chain agility

Variable	Frequency	Correlation	Significance
information integrity	225	0.233	0.000

As observed in table 3, the Pearson coefficient shows the correlation between the information integrity and the supply chain agility. The significance level of two variables is less than 0.05. The hypothesis is then confirmed. The correlation coefficient is 0.233 and positive. This means that there is a direct correlation between two variables. Put it differently, the supply chain agility would increases with information integrity.

Third Hypothesis

There is a correlation between the network integrity and the supply chain agility in Berjes Food Company.

Table 4: Pearson correlation results on the relation between the network integrity and the supply chain agility

Variable	Frequency	Correlation	Significance
network integrity	225	0.139	0.037

As observed in table 4, the Pearson coefficient shows the correlation between the network integrity and the supply chain agility. The significance level of two variables is less than 0.05. The hypothesis is then confirmed. The correlation coefficient is 0.139 and positive. This means that there is a direct correlation between two variables. Put it differently, the supply chain agility would increases with network integrity.

Multivariable Analysis

Table 5: A summary of regression model for supply chain agility

R	R^2	Adjusted R^2	S.E
0.677	0.458	0.439	10.10

Table 6: Variables input in the regression model of supply chain integrity

Variable	B	S.E	Beta	T	Sig
Constant	42.82	6.87	-	6.23	0.000
Supply chain integrity	2.21	0.54	0.46	4.04	0.000
Information integrity	1.52	0.58	0.30	2.60	0.012

Given tables 5 and 6, after entering all independent variables in the regression, two variables could explain 45.8 percent of the changes in supply chain integrity. Other variables did not have any significant correlation with the dependent variable and were eliminated from the model. So, only 43.9 percent of changes in supply chain integrity are explained by the independent variables.

Conclusion

First Hypothesis

Results disclosed that the correlation between supply chain integrity and supply chain agility. The significance level of two variables is 0.002 which is less than 0.05. The hypothesis is then confirmed. The correlation coefficient is 0.222 and positive. This means that there is a positive correlation between two variables. Put it differently, the more integrity between the processes of the supply chain, the more agile the supply chain would be. This agrees with what Nikabadi and Khatami (2009) found in this regard. In fact, the integrity between the processes of the supply chain in a producing company, providing services, responding to customers, paying attention to handling processes, etc. can have impact on the supply chain integrity and improve it.

Second Hypothesis

According to Pearson correlation test results, there is a correlation between the information integrity and the supply chain agility. The significance level of two variables is less than 0.05. The hypothesis is then confirmed. The correlation coefficient is 0.233 and positive. This means that there is a direct correlation between two variables. Put it differently, the supply chain agility would increases with information integrity.This agrees with what Pover (2005), Kim (2006), and Savadfard *et al.*, (2008) found in this regard. Information is always important for organizations. Accurate and organized information can improve supply chain integrity. Using new information technologies and developing such technologies improve the supply chain integrity.

Third Hypothesis

According to Pearson correlation test results, there is a correlation between the network integrity and the supply chain agility. The significance level of two variables is less than 0.05. The hypothesis is then confirmed. The correlation coefficient is 0.139 and positive. This means that there is a direct correlation between two variables. Put it differently, the supply chain agility would increases with network integrity.This agrees with what Nazemi and Kharidar (2012), and Woo (2009) found in this regard. The integrity of information network provides the ground for increasing the supply chain integrity.

Suggestions

1. Regarding the correctness of first hypothesis results based on the correlation between supply chain integrity and supply chain agility, the following suggestions are offered:

- Producing companies should create an integrated and coordinated system in the process of producing, distributing and other activities.
- In the process of production and supervision, there should be more communication between producers, distributors and consumers.
- Participatory communication and necessary interactions should be established, and such communication and coordination should be created between these factors.

2. Regarding the correctness of second hypothesis results based on the correlation between information integrity and supply chain agility, the following suggestions are offered:
- To facilitate the information flow and accurately managing it, a suitable ground of software, integrated information systems, etc. is required.
- To describe the buying and selling operation, advertisement, information, product and service exchange, integrated information systems should be used.

3. Regarding the correctness of third hypothesis results based on the correlation between network integrity and supply chain agility, the following suggestions are offered:
- Establishing a wide information network and communication among different sections of supply chain.
- Competing in the international level, increased advertisement, and providing a ground for entering trans-regional markets.
- Using an integrated and coordinated information and communication network in the supply chain process and applying creative forces and advanced network systems.

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