

THE EFFECT OF INFORMATION SYSTEMS ON SUPPLY CHAIN AND PERFORMANCE OF NATIONAL IRANIAN SOUTH OIL COMPANY (NISOC)

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ABSTRACT

Accepting a kind of suitable strategies for supply chain achievement is one of the requirements of a manufacturing company. Organizations to implement the different strategies of supply chain are required to use information systems. In this regard, this research respecting the different strategies of supply chain (lean and agile) and information systems strategies (efficiency and flexibility) attempt to examine the effect of these categories on supply chain performance and company.

The methodology and the nature of this research is descriptive-survey. Sample population of this research is made up of NISOC's managers and experts that are more than 2043 persons. By applying the Cochran's formula, the sample population of this research determined as 231 persons that 222 questionnaires completed and received. In this research, content validity and structure validity have been used and total questionnaire Cronbach's alpha is equal to 0.955 which indicates high level of reliability. Because of measuring the effect of some dependent and independent variables simultaneously, structure equations method (confirmation factor analysis) and Pearson coefficient test have been used.

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Results indicate, in term of correational coefficient , that the effect of all variables over supply chain performance of company has been in a high level, but by applying the independent t correational test and pierson the main hypothesis and 3 sub-hypotheses confirmed.

Keywords: Information system strategy, lean supply chain, agile supply chain, supply chain performance.

INTRODUCTION

In the past, organizations collaborated with each other and had short-term communication and thought to maximize yhe profit in short-term, but today both buyer and seller collaborate with each other based on long-term relations and profit. These factors led to formation of supply chains and transferred to supply and demand planning, supply of raw materials, production planning, inventory control, warehousing, distribution of products, and information management to supply chain, and since the activities of related organizaqtions in supply chain are close to each other, the coordination between members has an important role that by correct and timely interchange of information management, the needed coordination can be formed which these are possible in supply chain circumstance and these are done by supply chain so that customers receive good and services as soon as possible with low cost and high quality (Ahmadi, 2007). There are effective ways to be done for efficient improvement of the supply chain promotion and, including strategic relation with the supplier, relationship with customer relationship, level of information sharing, quality of information sharing, internal lean methods (Lee et al., 2006).

NISOC has numerous and diverse facilities, equipment for exploitation and exportation of oil. These facilities and equipment for constant operations need instruments and spare parts for continuum maintenance and repairs. The feature of facilities and used equipment makes the importance of oil industry in south, especially sensitive and determinant role of it in financial system of country and preventing the interruption or stagnation in daily operation, efficient and safety of these instruments and units and also execution of projects and pre-determined programs, necessity of the timely preparation and supplying the goods in the vast dimension and numerous types.

Supply chain network for an oil company, including all activities related to production and supplying, storage and demand transportation. This chain starts from the exploration and exploitation of oil & gas sources and continues to the delivery of petrochemical products to downstream industries. For a business with such a variety of activities, products and markets, planning is essential for all the supply chain network.

Also, in today's complex and competitive market, applying the technology and information technology are of necessary and needed tools for survival and development in global village. In this way, the correct applying of information systems throughout the supply chain can be an efficient factor in improvement of this chain. The activities of an information system prepare information needed for organizations decision making, control operation, analysis of the problems and creating new products or services and can be one of the efficient tools in this regard.

The complexity of products and services in today's world is such that institutions or organizations can hardly ,alone and without assistance and cooperation, with other organizations to produce a product or offer a service. Today, organizations have found that if they work together, total benefits is more to the situation that they obtain, alone, without coordination with other relevant organizations.

Most business experts believe to create competitive advantage compared to other companies as well as to maintain and improve the level of performance it is necessary that the supply chain strategy forward and support the business strategy. in the other word ,the two are parallel and also to maintain this competitive advantage applying technology and information technology is essential(jones et al.,2005).The fact is,less research related to this topic has been performed in country.so, it is worthy the academicians,researchers,practitioners in the country to make maximum use of information technology and communications,especially information systems and their role in improving the performance of different supply chain models and organizational performance achieve rigid and programmed studies.

As supply chains are becoming increasingly more complex and information technology programs are also evolving progressively,presenting a validating tool to evaluate supply chain performance is useful and it is expected that this study to be a useful guide for evaluation, positive impact of information systems strategies ,lean and agile supply chain strategies on supply chain performance and organization,especially NISOC facilitating more researches in this context.

Organizations to implement the different strategies of supply chain are required to use information systems and imparting of information system strategies consistent with used strategies of supply chain is one of the requirements of any organization that is considered by researchers and the interpretation based on experience creating some examples of success and

failure of companies in achievement of such coordination, but don't the other companies get success? so, the present study is an attempt for reviewing the balanced relations among SC strategy and IS strategy of supply chain and their effects on company and supply chain performance.

Research objectives and hypotheses

This study aimed to examine the impact of information systems strategy on supply chain and NISOC performance.

The main hypothesis

Information systems strategy affects supply chain and NISOC performance.

Sub-hypotheses

1-supply chain strategies affect on supply chain performance.

2-Information systems strategies have modulatory role in the effect of supply chain strategies on supply chain performance.

3-The performance supply chain indices affect on organizational performance.

RESULTS AND DISCUSSION

The nature and methodology of this research is descriptive-survey. The results were analyzed using confirmatory factor analysis. To perform the factor confirmatory, a questionnaire designed and its reliability, validity examined and then were collected by distribution sampling among experts. Data in this study were performed using SPSS and LISREL software, then the results were examined by PLS software.

Data collection tool includes questionnaires, library and field that the main of them is the questionnaire. Designed questionnaire included 35 five choices questions of likert scale that respondents have chosen the appropriate option from strong agree to strong disagree. First, the content validity of the present questionnaire was examined by experts, then initial 30 samples of that were distributed and analyzed for possible ambiguity. Finally, Cochran's unlimited population formula was used.

$$n = \frac{z_{\alpha/2}^2 \cdot S^2}{e^2} = \frac{(1.96)^2 \cdot (0.3615)^2}{(0.05)^2} = 201$$

The sampling method used in this research is random which after determining the sample total was applied, and thus the needed information were provided to carry out the rest of research. Sample population of this research is made up of nisoc's managers and experts that

are more than 2043 persons. By applying the cochrane's formula the sample population of this research determined as 201 persons that because of distance of units in nisoc and the probability of receiving the incompleted questionnaire,15 percent were added to the total population size that the questionnaire wsa delivered to 231 persons.In this study,the questionnaire incomplete data like deleted data were treated that 222 questionnaires completed and received.The time period of this research was limited to the fall of 1393 –spring of 1394.

Table 1. Previous researches conducted in abroad

NO	Author(s)	Year	Goal	Result
1	Wicker et al.	2009	Understanding the relationship between time and money to improve supply chain performance.	It is reviewed in great industries and shows how the analysis based on the time and cost can provide more accurate view of supply chain performance for better decision-making to achieve a competitive advantage.
2	Lee et al.	2006	The effect of supply chain methods on competitive advantage and organizational performance.	Higher level of SCM method can lead to improvement of competitive advantage and organizational performance. Also,the competitive advantage can have appositve direct effect on organizational performance .
3	Gunasekaran et al.	2008	Responsive supply chain:a competitive strategy of financial networks.	Responsive supply chain is a network of companies that are able to generate wealth for shareholders in a competitive environment through cost-efficient and rapid response to changing market needs. Responsive supply chain has considered the dynamic nature of the supply chain. Responsive supply chain consists of three main variables:

				<p>1. collaborative network network of partners</p> <p>2. Technology information systems (IT) 3- information system that their interaction lead to a responsive supply chain. Responsive supply chain variables lead to an increase speed and flexibility for supply chain that will ultimately lead to an increased competitive advantage.</p>
4	Gruznic et al.	2006	The effect of information system in strengthening the integration of supply chain in an oil company.	the methodology based on simulation in the preparatory process of this company, changes made in the deployment and integration of information technology in the delivery time, process achievement costs and quality, have been used.

Table 2. Previous Researches conducted in the country

NO	Author(s)	Year	Goal	Result
1	Esfand maz	2001	The application of information systems in improvement and integration of supply chain with SCOR model approach (Case Study: NISOC supplies and goods Office in Ahvaz).	Application of information systems can be efficient in reducing the cycle time, reducing the supply chain costs, inventories, and helps organizations more time to enhance the prediction of factors contributing to the progress beyond the time. Also, in each level of integration level especially higher levels can enhance to more increase in integration and to remove the problems created because of information limitation and relation.
2	Rahman	2008	The impact of	information Sharing with supply chain

	seresht		information sharing on competitive strategies and supply chain performance in iran's steel industry.	competitive strategies including responsiveness (coordination with environmental changes) and the ability of continually reduction of the cost (efficiency), have direct and significant relationship and supply chain competitive strategies also have significant correlation with supply chain performance.
3	sahraiyani	2004	The effect of information systems on supply chain improvement.	Application of reporting integrated system causes the improvement of coordination scale in supply chain and identifying the coordination points in powerhouse construction supply chain,the effect of management information system on each reviewed coordination points,and with weighting method to these parts,the coordination of improvement effect of each points on improvement of all supply chain have been showed.
4	Motallebi	2003	Designing a supply chain information system (Case study: Pars Mehr kam company)	Analysis of the problems of the current system and the need to design and implement an information system supply chain is identified.Then, the precise structure of designed information system and framework of its implementation has been studied. Using simulations, significant reductions in inventories in the proposed system is shown
5	Morteza poor	2001	Review of data and needed information	Model of integrated information system for researches offer chain

			systems for supply chain management (offer Chain Case Study of researches of Education)	according to the method of data transmitting using XML / EDI between members of the chain, is provided
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Conceptual definition of variables

Lean supply chain strategy: lean supply chain strategy is one of the aims of creating an efficient supply chain in cost. This is done by focusing on the reducing of the waste time(Wang et al.,2004). Lean supply chain strategy to create an efficient and cost-effective supply chain with a focus on reducing the delivery time and inventory waste of the products (Vonderembse et al., 2006 and Lee 2002), elimination of worthless activities, reducing the product design costs and reducing the level of inventories (Qrunfleh and et al. 2012). This variable is tested by cost reduction structures, high turnover of inventory, removing the wastes and non-value added activities, decreasing inventory levels and improving the existing products.

Agile supply chain strategy: the ability of a firm to perform the profitable operation in segmented and constantly changing market is accompanied with the use of high-quality, high-performance production, goods and services in accordance with customer demand (sourveloudis & Valavanis, 2002).

According to lou et al.(2004), the ability to respond quickly to market changes is called agility which is defined as a key component for the success and survival of firms in the market.

Agile supply chain reactes quickly and effectively to the changing markets in the changing and unpredictable competitive environment , which is operated by designed products for customers and services (Lin et al.,2006).In another definition,agile supply chain is to achieve the flexibility and adoptability in the presence of changing customer requirements and competitive environment through the fast,continous and dynamic response (Gunasekaran et al.,2008).This variable will be measured by short delivery time structures,the high level of inventory,production in different volumes,capacity development,rapid response and multi program design.

Supply chain performance: supply chain performance is defined as efficiency and total effectiveness of supply chain (Gunasekaran et al.,2001 and Beamon,1998) that this variable is measured by structures resources (efficiency), responding to the customer, flexibility and integration with partners.

NISOC performance: Evaluating the performance in organizational dimension is usually synonym with the effectiveness of activities, mean of effectiveness, the achievement rate of the objectives and programs with the functional characteristics of activities and operations. Overall performance evaluation system can be considered as measurement process, measurement and comparing the rate, and achievement method to the desired (Haji Jabari and Sar abadani, 2007).

Performance of the company refers to the achievement of the goals and objectives of financial performance of company and market (Lee et al., 2006). This variable is measured through market share structures, sales and competitive position and reducing the inventory levels and costs and timely delivery.

Validity

For determination of questionnaire initial validity, the content validity or experts was used. In this regard, initial questionnaire distributed among 30 experts of population and their opinion on the questionnaires were received and amendments were made to better understanding of the respondents. Cronbach's alpha was used to test the reliability of the questionnaire that initial and secondary Cronbach's alpha were obtained, respectively, 0.924 and 0.955 .

For data analysis, the statistical sample was tested by descriptive analysis of statistical sampling techniques and items descriptive statistics based on the Likert scale was presented in general and partial. The Pearson correlation test and the relation between dependent, independent variables were determined by using SPSS software. The suitability of the questionnaire was examined by using the LISREL software facility and confirmatory factor analysis and then the research model was fitted using the structural equations modeling (SEM) and hypotheses were examined based on presented indices, then the results of PLS software were also presented.

The results related to the research hypotheses

The results related to confirmatory factor analysis

For Confirmatory factor analysis of the questionnaire, all the variables are analyzed using LISREL software and the result is shown in Figure 1. .

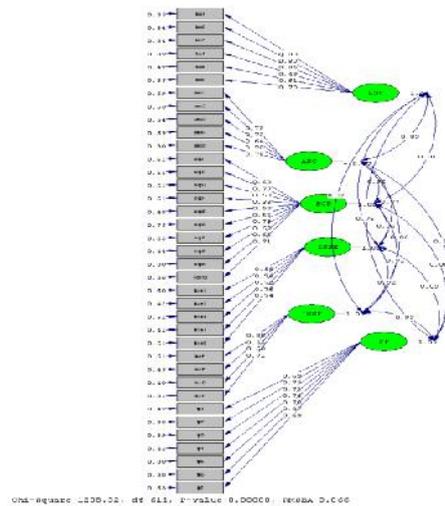


Fig.1. Confirmatory factor analysis in initial estimation

According to the above figure, all the factor loads are close to 1. Because the factor load is larger and closer to 1, one observed variable can better explain the hidden variable, the factor load is less than 0.3 is considered as a poor relation and it will be surrendered. Factor load between 0.3 and 0.6, greater than 0.6 is acceptable and highly desirable. As shown, for example, factor load between the hidden variable (LSC) of Lean supply chain and LSC1 shown 0.83 that it is very desirable, and so all factor loads are in a desirable level.

The t-static value indicates the significant correlations observed in %5 of error level. In figure 2, factor loads were replaced with values related to t-static that values less than 1.96 are not acceptable. According to figure 2, it can be seen that all the values are greater than 1.96.

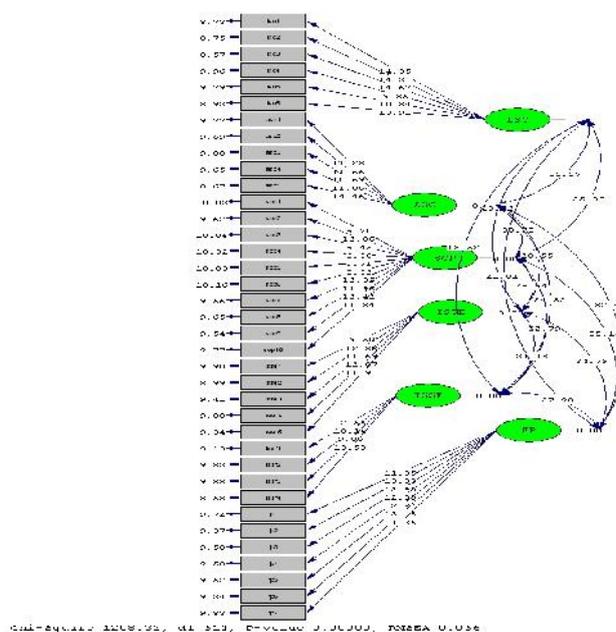


Fig.2. Confirmatory factor analysis (t-values)

In addition to the factor loads and t-statistic values which review the model fitness, fit indices present model fitness that are provided in Table1.

Table 1. The indices level for the confirmation of the questionnaire

IFI	NFFI	NFI	AGFI	GFI	RMSEA	SRMR	X2/df	Fitness index
0-1	>0/9	>0/9	>0/9	>0/9	<0/5	<0/5	1-5	Acceptance range
0/98	0/98	0/96	0/95	0/91	0/066	0/03	1/96	The model researched

According to figure 1,figure 2 and table 1 values,desighned values in questionnaire for this study (according to the steps of confirmatory factor analysis)are confirmed.

First,To examine the hypotheses, through examining the pierson correlation, we examine the correlation between the variables.

Table 2. The correlation level between variable

correlation level							
		LEAN SUPPLY CHAIN	AGILE SUPPLY CHAIN	Information systems strategy for EFFICIENCY	Information systems strategy for flexibility	SUPPLY CHAIN PERFORMANCE	COMPANY PERFORMANCE
Lean supply chain	CORRELATION LEVEL	1	.834**	.817**	.744**	.852**	.794**
	p-value		.000	.000	.000	.000	.000
	Sample number	222	222	222	222	222	222
Agile supply chain	CORRELATION LEVEL	.834**	1	.769**	.707**	.812**	.802**
	p-value	.000		.000	.000	.000	.000
	Sample number	222	222	222	222	222	222
Information systems strategy for efficiency	CORRELATION LEVEL	.817**	.769**	1	.752**	.855**	.771**
	p-value	.000	.000		.000	.000	.000
	Sample number	222	222	222	222	222	222
Information systems strategy for flexibility	CORRELATION LEVEL	.744**	.707**	.752**	1	.798**	.717**
	p-value	.000	.000	.000		.000	.000
	Sample number	222	222	222	222	222	222
Supply chain performance	CORRELATION LEVEL	.852**	.812**	.855**	.798**	1	.806**
	p-value	.000	.000	.000	.000		.000
	Sample number	222	222	222	222	222	222
company performance	CORRELATION LEVEL	.794**	.802**	.771**	.717**	.806**	1
	p-value	.000	.000	.000	.000	.000	
	Sample number	222	222	222	222	222	222
**. Correlation is significant at the 0.05 level (2-tailed).							

In this paper,to examine the hypotheses, four independent variables and 2 dependent variable were provided. The dependent variables include: supply chain performance and performance

of NISOC ,and Independent variables include: two strategies of the supply chain (lean supply chain and agile supply chain) and two information systems strategies (information system for efficiency and information system for flexibility)that two variables (information system for efficiency and information system for flexibility) were considered as intermediate variables.First, assumptions will be determined to investigate the correlation between dependent and independent variables.

Table 2 indicates that:

1.Correlation level between the dependent variable of supply chain performance ,lean supply chain and agile supply chain are 0.812 and 0.852,respectively . The p-value = 0, and the error coefficient is 0.05, which suggests that the independent variables of lean supply chain and agile supply chain are good predictors for dependent variable of supply chain performance .

2.Correlation level between the dependent variable of supply chain performance , information system for efficiency and information system for flexibility are , respectively, 0.798 and 0.855 ,respectively. The p-value = 0, and the error coefficient is 0.05, which suggests that the independent variables of information system for efficiency and information system for flexibility are good predictors for dependent variable of supply chain performance .

3.Correlation level between two variables of supply chain performance and company performance is 0.806 . The p-value = 0, and the error coefficient is 0.05, which this result suggests that there is a significant relation between variable of supply chain performance and company performance.

Now,according to these relations,a general model is assumed that variables of supply chain performance predictor followed by company performance can be predicted through it.In this section,we will analyze using structural equations modeling based on the hypothesis which there is about relations between structures. Now,in order to fit this theoretical model,we should use the fitness indices. The acceptance criteria in Table 1 is mentioned that,first, Based on these indices the model fitness will be tested.To continue the fitted model,(LISREL output)will be provided in order to make decision about prove or disapprove of hypotheses.

Analysis of the results for testing the hypotheses

According to figure 3 which shows the factor loads,the relationship between variables is specified.The value of t-statistic shows the observed significant correlations in 5% error level.

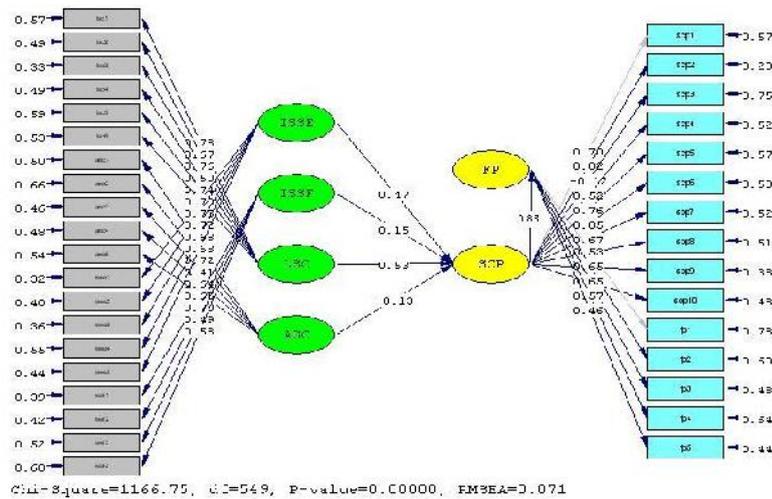


Fig.3. Structure of the relationship between variables

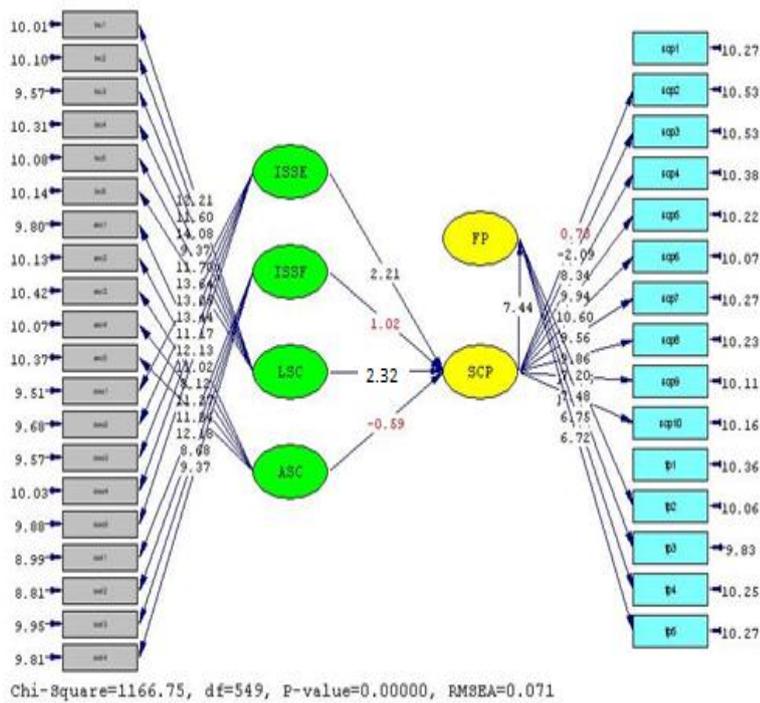


Fig.4. T-values related to model fitness

According to figure 3 and figure 4 and correlations level, we examine the hypotheses and relationships between variables.

The main hypothesis:

Information systems strategy affect supply chain and NISOC performance.

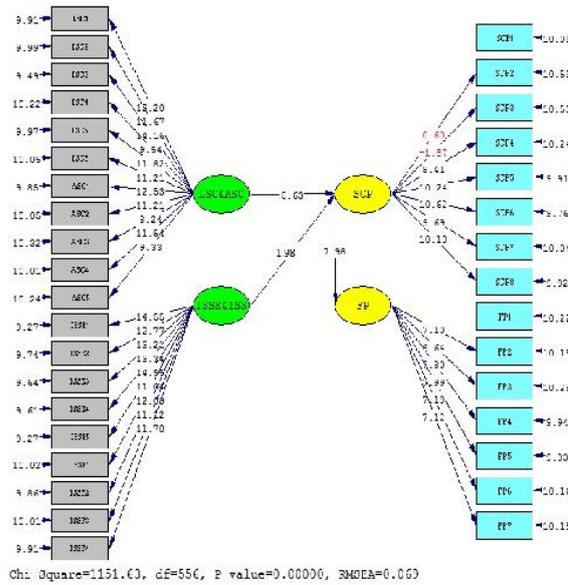


Fig.5. T-values for study of main hypothesis

According to figure 5, t-value related to this relationship is 1.98 that is greater than 1.96 and also RMSEA=0/069 that is greater 0.1 . so, main hypothesis is confirmed.

The first sub-hypothesis: supply chain strategies affect supply chain performance.

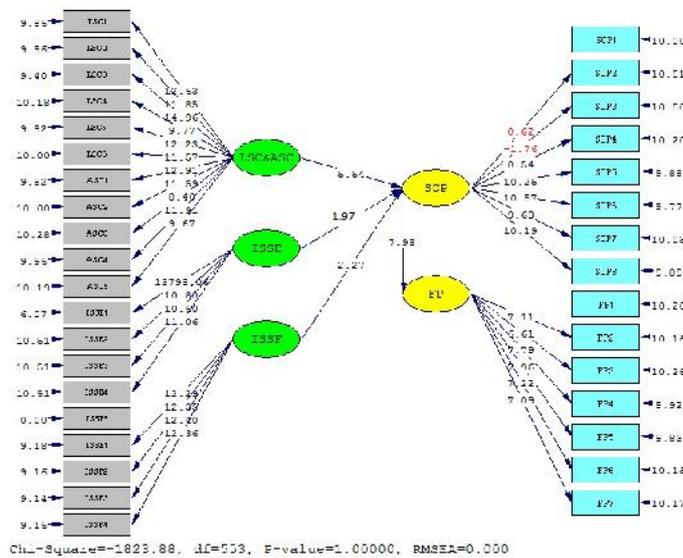


Fig.6.T-values for study of the first sub-hypothesis

According to figure 6, t-value related to this relationship is 5.54 and considering it is greater than 1.96 and RMSEA=0 ,so the first sub-hypothesis is confirmed.

The second sub-hypothesis: information systems strategies have the role of coordinating in the effect of supply chain strategies on supply chain performance.

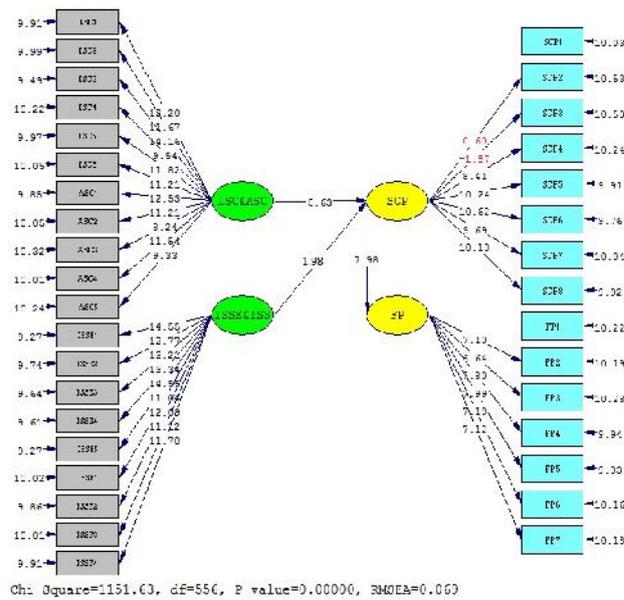


Fig.7.T-values for study of the second sub-hypothesis

According to figure 7, t-value related to this relationship is 1.98 and considering it is greater than 1.96 and RMSEA=0.069 ,so the second sub-hypothesis is confirmed.

The third sub-hypothesis: indices of supply chain performance affect the company performance.

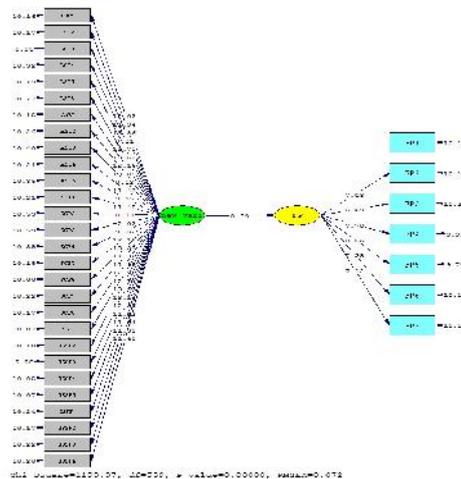


Fig.8. T-values for study of the third main hypothesis

According to figure 8, t-value related to this relationship is 8.89 and considering it is greater than 1.96 and RMSEA=0.072 .so,the third main hypothesis is also confirmed.

The results of hypotheses and comparing the results to others and recommending

Today, lean and agile patterns are considered by many manufacturing companies looking for improving their performance. Each Lean and agile approaches have their own advantages and strengths, and in particular circumstance have the maximum efficiency. Infact, both or one of the systems can be used according to the different characteristics and production systems of organizations. It can be stated that there is a positive and significant relationship between information systems strategy and supply chain strategy. The results have confirmed the main hypothesis, and by 95% of certainty, we can say that improving the supply chain performance can be raised by applying the information systems strategies. The result of this hypothesis is consistent with the results of research conducted by Esfand maz (2011).

Supply chain strategies affect supply chain performance. The results of this test are consistent with the results of Wicker, I. (2009), Gunasekaran et al., (2008).

Information systems strategies have the role of coordinating in the effect of supply chain strategies on supply chain performance. The results of this test is consistent with the results of Rahman Seresht (2008), Sahraiyani (2004), Motallebi (2001), Groznik et al., (2006).

Indices of Supply chain performance affect the performance of the company. The results of testing the hypothesis have no conflict with the results of Lee et al., (2006) study.

So, it is recommended that NISOC to update work processes based on industry standards at international level for improving the supply chain performance, to detect and remove expenditure items that do not create added value for improving according to the costs to income, it can recognize the stagnated goods and take necessary action to sell them, to determine the efficiency and effectiveness of the main activities carried out in the units to reduce costs per transaction, to use quality management techniques such as value engineering and efficiency management to eliminate wastes, to reduce the decision-making centers causes more speed in decisions and the accuracy of decisions and shortening the process chain, to require the applicants respond the questions timely or technical ambiguities with determining the time period for providing answers and legal levers and supporting them can be helpful for improving the supply chain integration, updating the computerized equipment in NISOC to increase the level of information systems use to enhance communication with customers and promoting the quickly respond to customers, informing about the results of timely receiving response, increasing the authorities of NISOC in connection with good supply chain due to elimination of intermediaries and direct relationship with manufacturers and suppliers can be effective in more quickly resolve of technical questions and shortening the cycle chain, the development of a uniform computerized system for goods in the Ministry of Petroleum level and mechanizing of existing warehouses to reduce the delivery time of goods and service,

Setting up a committee composed of the fully authorized customers of good uniform system in order to speed up decision-making of uniform is recommended.

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