Study the Effect of Supply Chain Uncertainty on Chain Supply Performance

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Abstract

When a company could design and establish a supply chain which fulfills the market demands, so it could change from a small company to a great market. The quality performance of a supply chain is dependent on different factors that its uncertainty could lead to quality decrease. The purpose of current research is to recognize effect of supply chains uncertainty factors on chain performance. This research is on the base of application purpose and the method of data gathering is descriptive survey-correlation and questionnaires instrument is also used for gathering data. For this,3 indicators is considered in supply chain uncertainty. These indicators include of suppliers uncertainty, process uncertainty, and demand uncertainty. The indicators are derived from evaluation model of (Bhatnagar & S.sohal,2005)..The obtained results of questionnaires are evaluated through SPSS software and regression test. These results indicate the reverse effect of all variables on supply chain performance.
KEY WORDS: Supply chain, performance, supply chain uncertainty.

INTRODUCTION

Supply chain management[1]is a subject which considered by many researchers in different fields. It was studied in 1990 decade ,when such issues as material flow are considered. This item allocated a great range of articles, newspaper and different publications to itself. In addition, it was an interesting issue for many professors and pioneers. In the past, companies themselves managed warehouses and transportation fleet, but nowadays they should study whether this activity is regarded as their core competencies[2]?In other case, it's very economical to outsource these tasks to other companies which their main work field is supply activities. Today, organizations experience "virtual integration" rather than vertical integration .They search for those companies which through their cooperation could accomplish all the necessary activities in their supply chain[8]. In research literature, the special criteria are considered for supply chain evaluation. The purpose of this research is to study the effect of uncertainty qualitative factors within supply chain on the chain performance.

RESEARCH LITERATURE

Supply chain performance
Supply chain includes a network of facilities and distribution methods which its role is preparing material, transportation of raw material, finished goods, and delivering this product to the customers [9]. Supply chain performance is referred to expanded activities of supply chain to meet all the requirements of final customer[7]. Performance measures of supply chain are more referred to expense and responsively to customers. Expenses include inventory, operation, distribution and production expenses; Customers responsive is referred to lack of inventory and probability (delay time, lack of inventory probability)[10].

A variety of measures are used in supply chain evaluation. Their purpose is to evaluate performance and efficiency improvement in whole of supply chain. Specific measures of supply chain performance in research literature are classified according to 4 bases: quality, time, expense and flexibility .In addition, they could be also classified according to their qualitative, quantitative, expense or non-expense and focus on technique /operation/strategic levels and process of supply chain[4].

Bhatnagar & S.sohal(2009) title performance measures of supply chain as follow[1]:

Time delay: From customers perspective, the criteria of order delivery time is considered as mean time interval of order date till receiving the consignment by customer(delivery)[13].

Inventory: Generally, Inventory is the distribution supply chain and includes all items from raw material and

Under production parts to final products. The Inventory is retained by manufacturers, distributors and retailers[8].

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Time to market: Time to market include time interval between put in mind a product design to supply it customers[3].

Quality: It indicates that product r service characteristics are in conformity with customers requirements and their expectations[11].

Customers service: According to warn Housman , a Stanford university professor, servicing refer to the ability to predict meeting customers demands through exclusive product and on time delivery[8].

Flexibility: Flexibility is defined as the ability of reaction and change with the least penalty in time, cost, and performance[12].

Supply chain uncertainty:

Christopher opinion regarding to supply chain is that "one of the main reason for retaining contingency reserve is uncertainty. This uncertainty maybe relates to a future demand or the suppliers ability to fulfill their promise or to the quality of materials and parts delivered by supplier" [6]. Uncertainty and risk are due to a multi results decision and its definite consequence isn't explicit formerly[5].

Bhavnagar & S.shoal considered the supply chain uncertainty to be includes of the 3 following categories:

- Supplier uncertainty: This type on uncertainty is as a result of weak performance of those suppliers that don't meet the companies needs and by virtue adding value will confused. This uncertainty could be studied through reviewing suppliers delivery performance, time series of delayed or canceled orders, real delivery date, qualitative reports of suppliers and time series of raw material reserve [6].

In fact, suppliers uncertainty is a result of suppliers disability to supply the production units need [1].

-Process uncertainty: This uncertainty has influence on the companies internal ability to accomplish production goals. It means there isn't any proper perceived of efficiency rate and time estimation for performing each work processes, or delivery process of specific product is competing again other products to gain resource[6]. Process uncertainty is a result of distrust in production process and unserviceable machinery[1].

Demand uncertainty: This aspect is related to customers and specifies changeableness and transparency of customers information process ,difference between markets final demand and processing orders by customers, and how we could fulfill customers need qualitatively. Uncertainty could be evaluated through expanding time series of customers order, canceled orders, delivering orders and predictions. Uncertainty decrease in each of uncertainty resource will lead to increase in integrity, and establishing integrity in each of supply chain section is uncertainty decrease in that section of chain [6] Demand uncertainty is a result of disability to predict demand precisely [1].

In order to achieve company's strategic and goals ,so it is necessary to evaluate proper and complete performance of supply chain in different field from operating perspective. In this case, those weak and strength points are distinguished and apply about their elimination or improvement [2].So, in this research the necessity to study the effect of uncertainty factors in supply chain on chain performance qualitatively is observed. **The main research question here is whether uncertainty factors and its diminutions has effect on supply chain performance.**

RESEARCH METHOD

From scope perspective, this is an application research and classified as a research with descriptive nature, and regarding to the type of supervision and control this is a field research. The research method is correlation. Regression analysis method is used to consider independent variable of effective factors in supply chain uncertainty and its dimensions and also dependent variable of supply chain performance.

According to research purposes ,research type and studied variables ,the research hypotheses are considered as following:

Main Hypothesis: The uncertainty factors in supply chain has effect on supply chain performance.
Sub-hypothesis1: Suppliers uncertainty has effect on supply chain performance.
Sub-hypothesis2: Process uncertainty has effect on supply chain performance.
Sub-hypothesis3: Demand uncertainty has effect on supply chain.

The statistical population in this research consist of supply chain experts in a number of petrochemical companies ,and sampling method is classify randomly .According to the limitation of statistic population and Cochran formula for limited populations the sample size is calculated as 76.Field research method is used for data gathering, and instrument of questionnaire is used in likert scale of 5 degree. Questionnaire of supply chain performance include 17 items ,and its reliability is calculated through Cronbach Alpha test as 0.866.The

questionnaire regarding to uncertainty factors in supply chain includes 17 items, and its reliability is calculated through Cronbach Alpha test as 0.793 and is confirmed, After preparation and design, both of these questionnaires submitted to professors and specialist in petrochemical company and after necessary revision ,they are confirmed.

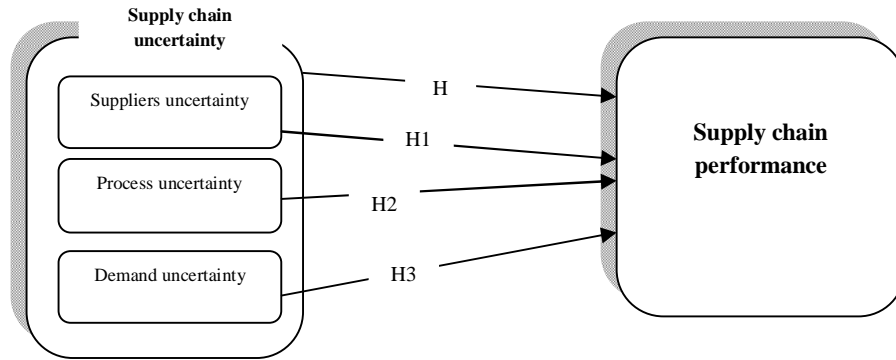The following figure is presented as a conceptual model for hypotheses variable relation

Figure 1:Research conceptual method

Data analysis
Research hypotheses test
Regression test is used to study research hypotheses and its results are listed in table(1).

Table 1: Results of Regression Test of Theories

	constant	Relation intensity	B coefficient	sig	result
Sub-hypothesis1	-11.61	91.8%	-0.345	0.002	confirmed
Sub-hypothesis2	-14.85	79.2%	-0.241	0.000	confirmed
Sub-hypothesis3	-12.46	82.9%	-0.184	0.024	confirmed
Main hypothesis	-16.859	94.3%	0.472	0.001	confirmed

Hypothesis1:Suppliers uncertainty has effect on the supply chain performance.
According to the listed results in table (1), so the above hypothesis in considered petrochemical industry is confirmed. Supply chain performance is effected by supplier uncertainty. The intensity of this effect is 91.8% and regarding to the negativity of beta coefficient, so the effect is reversed. The regression equilibrium of the mentioned hypothesis in petrochemical is calculated as follow:
Supply chain performance = -0.345(suppliers uncertainty) -11.61

Hypothesis 2:Procress uncertainty has effect on the supply chain performance.
According to the listed results in table(1),so the above hypothesis in considered petrochemical industry is confirmed. **supply chain performance** is effected by process uncertainty. The intensity of this effect is 79.2% and regarding to the negativity of beta coefficient, so this effect is reversed. Te regression equilibrium of the mentioned hypothesis in petrochemical is calculated as follow:
Supply chain performance = -0.241(process uncertainty) -14.58

**Hypothesis 3:Demand uncertainty has effect on the supply chain performance.**
According to the listed results in table(1),so the above hypothesis in considered petrochemical industry is confirmed. **supply chain performance** is effected by demand uncertainty. The intensity of this effect is 82.9% and regarding to the negativity of beta coefficient, so this effect is reversed. Te regression equilibrium of the mentioned hypothesis in petrochemical is calculated as follow:
Supply chain performance = -0.184(demand uncertainty)-12.46

Main Hypothesis: Uncertainty factors of supply chain has effect on the supply chain performance.

According to the listed results in table(1),so the above hypothesis in considered petrochemical industry is confirmed. **supply chain performance** is effected by chain uncertainty factors. The intensity of this effect is 94.3% and regarding to the negativity of beta coefficient, so this effect is reversed. Te regression equilibrium of the mentioned hypothesis in petrochemical is calculated as follow:

Supply chain performance = -0.472(supply chain uncertainty)-16.859
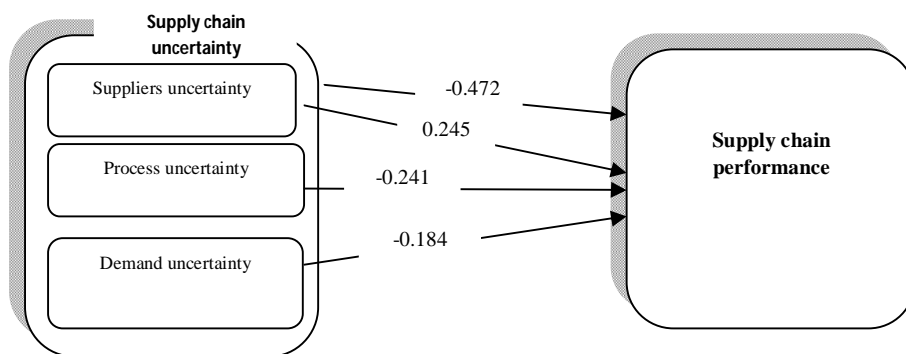
Figure2:Diagramof determination coefficient of predicting the effect of dependent variable by independent variable.

Conclusion

It can be concluded from the results of regression test for the first hypothesis that supplier's uncertainty has negative effect on SC performance so that if suppliers have weak performance in delivering materials to the company and supplier's uncertainty is high, Sc performance is negatively affected and decreased. Therefore it is suggested that in order to choose the best supplier and decrease risk degree in delivering materials, new methods of operation research be used and delivery time be evaluated and the suppliers past performance be regarded so that the best supplier can be chosen.

It can also be concluded from regression test for the second hypothesis of the research that production process uncertainty has negative effect on SC performance. If the company's internal ability to estimate production goals is low and it can not have a good understanding of the working time, SC performance will be negatively affected. It is proposed to use preventive maintenance and overhaul system in order to increase production line stop.

It can be concluded from regression test for the third hypothesis that demand uncertainty has negative effect on SC performance. Therefore if the company is not able to foresee the variability in customers' orders and customers' expectations from quality, then the SC performance will be negatively affected.

Finally it can be concluded from regression test for the main hypothesis that in general the factors of uncertainty in SC have negative effect on SC performance and the companies must not pay attention to only one of the factors because these factors affect SC performance besides each other.

It is proposed that this model be utilized in other industries that have essential need in SC for their productions and its results be investigated and SC performance be studied, other effective factors also be studied, factors affecting development of SC be studied. It is also proposed that new methods and techniques of OR like non-parametric techniques such as DEA be utilized for SC performance evaluation. Network DEA is a method that can be used in measuring SC performance.

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