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The Impact of Supply Chain Management on Industrial Efficiency and Technical Performance (Case Study: Engineering New Enterprises of Guilan Province, Northern of Iran)

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Abstract

An important issue for suppliers, producers, and retailers who want to compete in a competitive environment is continuous performance improvement in a dynamic supply chain. Literature review on supply chain puts more emphasis on quantitative factors than other factors. In this research, we focus on quantitative factors which affect competitive advantages creation and investigation. Our goal is to examine the qualitative factors which affect the supply chain management (e.g. supply chain uncertainty, plant location, and manufacturing practices) based on performance evaluation models and at last we give some solutions to improve the performance. Questionnaire was used to collect data and regression statistical method to examine the research hypothesis. According to the results, plant location, supply chain uncertainty and manufacturing practices factors influenced petrochemical industry supply chain performance.

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INTRODUCTION

Supply chain management is the field of interest of many researchers in different disciplines. Supply chain was introduced in 1990 when issues related to the circulation material were formed. These categories won a wide variety of press articles and various publications; moreover, a lot of teachers and pioneers were interested in it.

In general, a supply chain consists of different activities including: logistics, inventory, supplying resources and purchasing, production planning, the relationship between and within the organization and measuring performance (Kanda & Deshmukh, 2008). Indeed, supply chain management is nothing but integration processes, supply chain from the supplier of the primary to the client end in order to create satisfaction for the consumer end (Rajeev et al., 2017). As individuals, to use the skills, knowledge and ability of others to interact with their pay, the company also establishes relations and cooperation with companies that show skills, knowledge, abilities, and perhaps are more complete than their own favorite resources (Kozlenkova et al., 2015). Warehouses and companies consider their past transport fleet, but today, they should review whether these activities are a central part of its merit or not; and if not, would it be a more cost effective operation of the companies that their main job is logistic activities to outsource. Today, instead of organizations' vertical integration, "virtual integration" of the experience is applied. They seek companies through the activities needed for supply chains to run (Christopher, 2011). If the company could supply chain design and create a responsive market demand, it can turn into a great small market. For this purpose, in order to meet market demand to form a profitable operation, efficient supply chain plays a central role. A company must know in what cases favorable supply chain performance has been done so far. Then it must be decided what activities are to be focused in order to add more value (Ibid). Supply chain provides effective ways to create more value for customers. For example, a supply chain through innovation and continuous improvement, system integration and reform in the industry profitable levels can lead to creating value for customers (Jayaram et al., 2014). There highest value chain to the final customers is definitely the demand for products and services. This chain is suitable for local business manufacturers, logistics service companies, distributors and retailers. In this chain, the total supply chain performance is heavily on a company's ability to grow and thus affects its standards of performance over time and will promot it (Kozlenkova et al., 2015). Currently, the company cannot enter the chain unless able it reaches the level of those standards. This means that companies that function well in their key operations, in order to provide maximum value to the final customer, and only cooperate in the supply chains have this choice. Achieving the expected performance of supply chains requires to control the company and its operations on a daily basis (Addo-Tenkorang & Helo, 2016). Performance evaluation of special measures in four areas of supply chain is categorized as: quality, time, cost and flexibility. In addition, they are based on quantitative or qualitative being charged or noncharged and being focused on levels of technical / operational / strategic processes and supply chain has also been classified (Jayaram et al., 2014). This paper seeks to investigate the effect of quality factors such as positioning the production, supply chain uncertainty and manufacturing practices on supply chain performance.

RESEARCH PROBLEM

Today supply chain is facing severe challenges and competitive market pressures, including globalization, competition and cooperation, diversity of customer requirements and short product life cycle as a principle. So for the macro and strategic objectives of the company can be achieved; it is necessary to assess the supply chain from the perspective of different functional areas. Thereby, strengths and weaknesses can be identified and later can strengthen, improve or remove the action (Sodhi & Tang, 2011). Considering the role of petrochemical industry in Iran's economy, improving the performance of supply chain petrochemical industry can be an important step towards achieving major goals in the economy. And due to the lack of research needed in the field of qualitative factors affecting performance supply chain, such as positioning the production, supply chain uncertainty and

manufacturing practices used in the petrochemical industry, this study tries to answer the following questions:

1. Is locating the agent producing petrochemical supply chain performance effective?
2. Is the uncertainty factor in the supply chain performance petrochemical supply chain effective?
3. Is the operating performance measure manufacturing petrochemical supply chain effective?

BACKGROUND RESEARCH

Many theoretical frameworks such as cost theory, resource dependence theory in explaining and attitude industrial networks are involved in supply chain relationships. This theory of the identity of supply chain is interpreted differently. Motivated transaction gives cost approach to building relationships with firms with lower costs of transaction (Cai et al., 2013). Harrison believes trade relations, a governing structure special in management efficient transactions, uncertainty, degree of affiliation to the different behavioral characteristic assets greater human chains (Harrison, 2004). Theory depends on resources, relationships between companies as a response strategic uncertainty and dependent consideration (Davis & Cobb, 2010). Based on the theory of survival of corporate resources related to rare, and as a result of the organization of relationships, they get resources which they use (Esteve-Perez & Manez-Castillejo, 2008). Industry is the approach which depends on understanding and describing dynamics in developing, maintaining, and ending relations exchange in the organization. Based approach to networking, industrial, trade involves relations double-enabled Drbh place ties exchange in industrial networks (Chopra & Meindl, 2015). Quality evaluation of relations in global supply chain relationships nearly fulfills the needs and parties' expectations are considered based on record success or failure in the face of events (Mollenkopf et al., 2010). "Bhatnagar and Sohal" supply chain performance measures are expressed as follows:

- Latency: the scale for the delivery order, the customer perspective, and the average time interval due to order early shipments received (sent) by the customer.
- Inventory: inventory of the entire supply chain is playing everything from raw materials and components during construction of the final products are included. Inventory by manufacturers, distributors and retailers are kept.
- Time to market: time to market of the time gap between the words forming the idea of product design to product presentation to customers.
- Quality: International Standards Organization is defined quality: integrity, characteristics that product or service the ability to meet customer needs is.
- Customer service: "service to the week in anticipation of the ability to meet customer demand through specific products and deliver on time any person is on.

Flexibility: flexibility and the ability to react to change with minimal fines at the time, cost and performance is defined (Bhatnagar & Sohal, 2005).

Supply chains, all companies and activities required for the business design, manufacture, delivery and use of a product or service are included. Any business to survive and progress to the supply chains themselves depends on and each chain plays a role (Lund & Marinova, 2014) "When and others" model was presented in the supply chain with an emphasis on systematic way for improving key performance and its implementation. This model identifies determinants of cost in implementing key performance indicators and provides strategies for improving performance in a supply chain decision maker. The researchers have used models to describe the debate surrounding a large retail companies (Cai et al., 2009) and others to integrate Features Balanced Scorecard and supply chain operations reference model to provide a comprehensive model to measure corporate performance of small and medium-sized deal. They introduced a set of performance indicators to supply chain processes such as "resource", "construction" and "delivered" in small and medium companies (Taleghani et al., 2014). These indicators describe benchmarks in various stages of supply chain such as purchasing, production, replenishment and customer orders. Then a comprehensive modeling is created and used in order to assess supply chain planning in companies of small and medium to express instructions comprehensive, on imple-

mentation (Thakkar et al., 2009). Bhatnagar and Sohal have done research on competitive supply chain. They stated that supply chain performance is located under the influence of several factors that locate production begins,. The purpose of this study provides a framework that includes qualitative factors in decisions regarding the location of production, supply chain uncertainty and manufacturing practices and production. It results to some extent the claim that the correlation between quality factors locate production, supply chain uncertainty and manufacturing practices confirms supply chain competitiveness (Bhatnagar & Sohal, 2005).

CONCEPTUAL MODEL

Model study is on the performance assessment model "Bhatnagar & Sohal". This model displays factor in effect positioning the production, supply chain uncertainty, performance measures manufacturing supply chain. Fig.1. presents research conceptual model.

RESEARCH HYPOTHESES

Regarding the abovementioned issues, this research deals with the following assumptions:

1. Plant location factors have a significant effect on the supply chain performance.
2. Supply chain uncertainty has a significant effect on the supply chain performance.
3. Manufacturing practices has a significant impact on supply chain performance.

RESEARCH METHODOLOGY

The statistical community of this applied research includes specialists in the supply chain circuit technology of ten petrochemical companies including Maroon, martyr Tongouyan Karun, Khuzestan, Ghadir, Amir Kabir, Bo Ali Sina, Bandar Imam, Razi. Total population included 138 times the statistical formula and the estimated sample size is 71. Data collection of field research methods and tools were used in the questionnaire. The questionnaire was designed based on Likert scale spectrum (very low, low, medium, high & very high). Regression techniques were used to process the statistics.

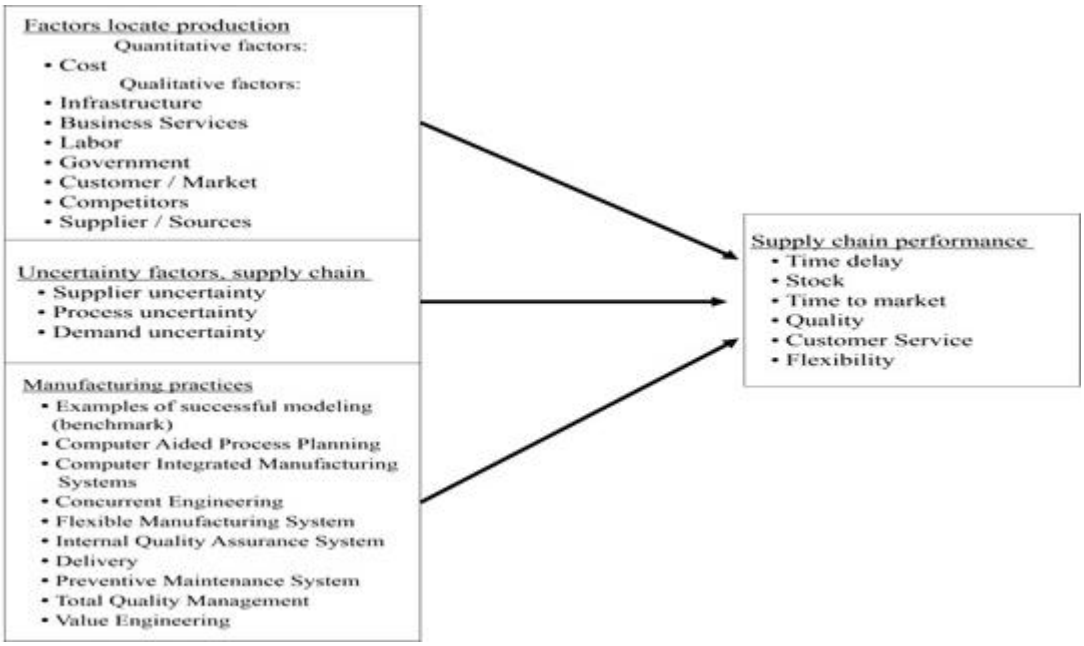

Fig. 1. conceptual model of research based on performance assessment model of Bhatnagar & Sohal

Questionnaire included 57 questions as follows:

Question 1 of 31 variables related to the production location. To facilitate interpretation of results, 31 special features locate production in eight categories, were grouped. Criteria used to locate each of the factors of production are presented in Table 1.

Table 1: Benchmarks locate production

Structure	Criteria used
Costs	Cost of land, energy, transportation, business services, communications, labor supply
Infrastructure	Availability of land, energy, communications (telecommunications), Quality Communications
Business Services	Access to land transport, maritime transport, financial services, access to information technology
Work force	Labor education, labor skills, labor productivity
Government	Presence of supportive institutions, government stability, government policies, stable tax policies, trade policies, stability, protection of foreign investments by the government
Customer/market	Proximity to markets, market size, stability, market
Competitive	Location Key Competitors
Suppliers	Access to suppliers, proximity to key suppliers

Questions 32 to 39 are related to the supply chain uncertainty. Eight criteria were used for assessing supply chain uncertainty demand, supplier and process. The entioned Criteria are presented in Table 2.

Table 2: Criteria of supply chain uncertainty

Factors	Criteria
Supplier uncertainty	The average duration delivered by suppliers The average accuracy suppliers Average quality suppliers The average length of time with suppliers
Process uncertainty	Period without stopping the production line program Stop the planned production period
Demand uncertainty	Monthly demand forecast accuracy Size and number of major customers

Questions 40 to 49 are related to manufacturing activities. In this study, ten cases of manufacturing activities have been proposed. Manufacturing steps have been outlined in Table 3.

Questions 50 to 57 are related to measuring supply chain performance. Six variables were used to measure the operational structure. Scales used for all six structures are presented in Table4.

Table 3: Manufacturing measures

Manufacturing practices
Examples of successful modeling (Benchmark)
Computer Aided Process Planning (CAPP)
Computer integrated manufacturing (CIM)
Concurrent Engineering
Flexible manufacturing system (FMS)
Internal Quality Assurance System
Just in time production system (JIT)
System repairs and preventive maintenance (PM)
Total quality management (TQM)
Value Engineering

Table 4: Supply chain performance measures

Structure	Measure performance
Time delay	Improve the delay time over the last three years
Inventory	Improving inventory turnover last three years Improved inventory levels during the past three years
Time to market	Time to market performance over the past three years
Quality	Improve the purity materials last three years
Customer Service	Rate of production items meet the past three years Status of inventory shortages during the past three years
Flexibility	Improve the flexibility of the last three years

It should be noted that Cronbach's alpha coefficient was used to measure the reliability of the questionnaire. Calculated Cronbach's alpha coefficients presented in Table 5.

CONCLUSION

This section describes the results of variables and then tests the research hypothesis. Results from each of the described variables are presented in Table 6.

To test the hypothesis, statistical regression methods were used. In each of these tests is individually zero, "each of the independent variables on performance is affecting the petrochemical industry supply chain" and "any of the independent variables on the performance of petrochemical industry supply chain is effective. The test results are presented in Table 7. It should be noted that regression analysis is meaningful if the level is smaller than the error level (in this research, 05 / 0) may assume H1 is accepted.

Table 5: Cronbach's alpha coefficients

Variable	Conclusions	Number of index	Cronbach's alpha
Locate production	Reliable	31	0.845
Supply chain uncertainty	Reliable	8	0.93
Manufacturing practices	Reliable	10	0.745
Supply chain performance	Reliable	8	0.76

Table 6: Description of study variables

Variable	Minimum	Maximum	AVREAGE	Standard deviation	Variance
Locate production	55	119	73.419	13.5	182.251
Supply chain uncertainty	25	33	30.5	4.503	20.285
Manufacturing practices	16	45	30.4	8.669	75.155
Supply chain performance	16	35	25	5.855	34.285

Table 7: Results of hypothesis testing research

Model link / Hypothesis tests	Significant level of sig	Correlation coefficient R	Coefficient of determination R Square	Coefficient of B	Conclusion
Locate production (→)	0.015	0.301	0.09	0.112	Accepted
Supply chain uncertainty (→)	0.001	0.385	0.148	-0.491	Accepted
Manufacturing practices (→)	0.000	0.420	0.176	0.265	Accepted

Table 7 can be indicates that the three hypotheses are confirmed. In the petrochemical industry, supply chain performance factors directly affect the production and positioning actions are manufacturing and supply chain uncertainty into the reverse supply chain performance is impressive. Considering the correlation coefficients obtained in table and comparing them, it can be concluded that the severity of the effect of independent variables on supply chain performance is different. The results can be summarized as follows:

Results related to Hypothesis One:

- According to the first hypothesis, it can be said that the manager's decision on production location must include energy costs (water, electricity and other energy requirements in the petrochemical industry) and business expenses such as cost transport and communications to the desired location and the lowest local cost.

- choose of location in terms of the availability of land to produce energy (e.g. the availability of fresh water in petrochemical industry is required) must be considered.

- Manufacturing factory managers should consider government policies in different geographical areas rates of tax and trade laws. Results related to hypothesis II: to select the best suppliers and reduce uncertainty petrochemical supply

chains should be such as suppliers and delivery time by more carefully selected suppliers. To reduce the period without stopping the production line program is suggested that the use of preventive maintenance system be used. Results related to Hypothesis III: For problems related to loss of hand preparation programs and increase the performance of the production process, using software system to computer aided process planning can be effective. Also to integrate activities such as computer aided design, manufacture and repair of computers to help produce an integrated system to help computers are used. During the product design stage of expert opinions of various units such as production, quality, safety, industrial hygiene, shopping and so reduce the time for advance design and balancing parameters designed to prevent the creation of high costs and redesign using be. It can also be designed to combine operations and shared by specialist's suppliers and manufacturers (Company). N. will provide knowledge that suppliers require to reduce costs and help them produce the potential problems to improve the quality of parts and raw materials from petrochemical companies and help them to achieve common goals of both organizations (and provider producers) use the production system when it can play an effective role. This approach is for creating strong and ongoing relationships with a limited number of suppliers.

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