

Relationship between Manufacturer Product Strategies and Supply Chain Inventory in a Company

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Abstract: The purpose of this study was to review the relationship between manufacturer product strategies with supply chain inventory a Iran Company. For this purpose the relationship between manufacturer product strategies with hierarchical structure and flexibility manufacturing strategies with supply chain inventory were investigated. This study is of applied and survey type. The statistical society used in this research include, marketing managers, production and financial managers and industry engineers that work in Company. The number of mangers mentioned above is 25 that were chosen as our statistical society. The capacity of sample statistic is equal of 20 that, is selected by class accidental sampling. The methods of gathering of information in this research is questionnaire. Also designed on the basis of 5 selection Likert scale. The Crombach was equal $\alpha=0.855$ and it has enough credit. In this research the relationship between manufacturer product strategies and supply chain inventory collection from among the scholars in different parts of the industry who are working in production management, financial management, industrial management and marketing departments of different firms and the case sample comprised warehouse suppliers' chain of the firms. The hypotheses of this research are analysed by Chi-square test and variance analysis (ANOVA) of statistic exam. The results of research show that there is no relationship between the manufacturer product strategies and hierarchical structure but there is a relationship between supply chain inventory and hierarchical structure. Similarly, there is a relationship between flexible manufacturing strategies and supply chain inventory.

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Key words: Manufacturer Product Strategy, Flexibility manufacturing strategy, Cost leadership strategy, Supply chain Inventory, Supply chain inventory management

1. Introduction

The main purpose of determining organization strategy is product and activity market selection. In other words, the aim of supply chain is defining that which of the existing products of an organization must be characterized as main and strategic purpose of the organization in terms of existing markets and is aligned with the organization's mission. Producers have benefited of on time production and other management initiatives to improve the effectiveness of their production. So selecting the most appropriate strategies to produce products with inventory supply chain in any manufacturing organization is necessary. Integrated global economy has required companies to use more appropriate tools. Generally, the definitions introduced during the last three decades are due to the introduction of production strategy, and different definitions have been offered by theorists. The first definition of the production strategy was offered by Skinner (Skinner) in 1969 and he defined product strategy as exploiting the manufacturing features and capabilities as a competitive weapon, and defined the strategy of producing like this: "Production Strategy is a series of

coordinated decisions in the manufacturing sector that is in line with business strategy and causes long-term competitive advantage in the company." Meanwhile, in the warehouse supply chain management, orders were created only by modified data of companies, but now information technology allows companies to share on demand and valuable and faster data are gained by inventory. In determining warehouse supply chain, always the producer is the decision-maker. Also, Product manufacturer's strategies should be taken into consideration in inventory supply chain designing. Companies using the results of this study can use it to select the appropriate strategy to develop their markets. It is also used as a template in selecting methods to develop its activities in relation to their internal and external suppliers. Eventually, it can use these results in its strategic decision-makings.

2. Research Literature

Theoretical review of this study includes the definition and classification of three strategic levels and three flexible levels of companies in the manufacturing system. Then, by providing concepts

and attitudes of supply chain, conceptual framework of supply chain inventory; it has explained the relationship between supply chain inventory communication and manufacturer product strategies. Below are brief outlined definitions of each concept:

2. 1. Strategic levels:

Three levels are defined in the company for strategic planning, according to figure (1) as follows (Jafarnejad, 2009):

1) The company strategy: strategy covers the major decisions in the company. These cannot be decided decentralized or by lower level managers. Based on the firm's strategy, the decision was made due to the scope of operations and businesses that our company wanted to participate. In this level of firm's strategy, the decision was made about horizontal and vertical mergers of company and growth or downsizing of companies.

Table 1. Central and distribution indices of questions about first hypothesis

| | Expected | Observed | |
|----------|----------|----------|-----------|
| Residual | N | N | |
| -54.0 | 78.0 | 24 | Very low |
| 22.0 | 78.0 | 100 | Low |
| 37.0 | 78.0 | 115 | Average |
| 35.0 | 78.0 | 113 | High |
| -40.0 | 78.0 | 38 | Very high |
| | | 390 | Total |

Business strategy: This strategy, how to compete in any business is considered. Business managers make decisions on competitive advantage of any business

according to company's overall strategy. Functional strategies: functional strategies focused on creating capabilities that guarantee business strategy success. Company's functional strategies include: (financial, human resources, technology, purchasing, production, marketing and R & D). A strategic vision of functional parts means that these sectors can be coordinated better with higher level strategies than competitors. According to this view, the production strategy is considered as a functional strategy that is designed to support the company's business strategy. The first definition of the Skinner about production strategy was produced in 1969. He defined production strategy as benefiting of exploiting the product features and manufacturing capabilities as a competitive weapon. But theorists have offered different definitions afterwards. In general, the production strategy definitions can be classified into two categories. Basis of this classification is related to the role of strategic production. Based on these concepts, it can be said that: the production strategy is a series of coordinated decisions in the manufacturing sector that is in line with business strategy and causes long-term business advantages in the company and at the same time, production strategy is a vision that differentiates a company from other companies in the industry and creates stability in decisions and gives orientation to organizational activities. (Jafarnejad, 2009).

2.2. Flexible levels in manufacturing system:

There are three different levels according to Figure 2 in flexibility of manufacturing system:

Table 2. Central and distribution indices of questions about second hypothesis

| | N | Mean | Sd.deviation | Sd.Erro | Lower Bound | Upper Bound | Mimumum | Maximum |
|--------------------------|-----|---------|--------------|---------|-------------|-------------|---------|---------|
| Organic Strategy | 20 | 6.700 | 1.26074 | .28191 | 6.1100 | 6.1100 | 4.00 | 9.00 |
| Flexibility Strategy | 20 | 12.0500 | 1.50350 | .33619 | 11.3463 | 11.3463 | 8.00 | 15.00 |
| Process Strategy | 20 | 7.0500 | 1.39454 | .31183 | 6.3973 | 6.3973 | 5.00 | 10.00 |
| Focus Strategy | 20 | 3.6000 | .88258 | .19735 | 3.1869 | 3.1869 | 1.00 | 5.00 |
| Differentiation Strategy | 20 | 6.7000 | 1.68897 | .37767 | 5.9095 | 5.9095 | 4.00 | 10.00 |
| Total | 100 | 7.2200 | 3.04704 | .30470 | 6.6154 | 6.6154 | 1.00 | 15.00 |

2.3. Strategic level, production system level and production sources

In Strategic level, the external flexibility manufacturing system is considered, i.e. the flexibility of company in dealing with customers and suppliers is considered. Strategic flexibility (external) can be divided into two groups of outputs and inputs flexibility. Output flexibility is related to company's products and input flexibility is related to primary sources. Lack of proper understanding of the

company's flexibility levels leads to assessment criteria interference and ultimately, leads to incomplete or incorrect evaluation of flexibility. Researchers have introduced different dimensions for each level which include: A - Outputs flexibility that includes product flexibility, product mixture flexibility, product volume flexibility and delivery flexibility; B - production system flexibility includes capacity, physical size, production pack size and total delay time c - manufacturing resources flexibility includes

multi product machines, machine setup time, labour force skills and materials management system. In Production system level, rate of flexibility of production system to achieve external flexibility is assessed. In fact, in the first level, flexibility is discussed regarding the external environment, while in the next two levels, the internal features are

considered to achieve flexibility. (Same source)

2.4. Manufacturer Product strategies:

In Figure 3, the status of manufacturer product strategies are shown. In this regard, R. David has provided strategies that are as below (David, 2005):

Table 3. central and distribution indices about questions of third hypothesis

| | N | Mean | Sd. dev | Sd. Err | Lower Bound | Upper Bound | Min | Max |
|--------------------------|-----|---------|---------|---------|-------------|-------------|------|-------|
| Organic Strategy | 20 | 6.700 | 1.26074 | .28191 | 6.1100 | 7.2900 | 4.00 | 9.00 |
| Flexibility Strategy | 20 | 12.0500 | 1.50350 | .33619 | 11.3463 | 12.7537 | 8.00 | 15.00 |
| Process Strategy | 20 | 7.0500 | 1.39454 | .31183 | 6.3973 | 7.7027 | 5.00 | 10.00 |
| Focus Strategy | 20 | 3.6000 | .88258 | .19735 | 3.1869 | 4.0131 | 1.00 | 5.00 |
| Differentiation Strategy | 20 | 6.7000 | 1.68897 | .37767 | 5.9095 | 7.4905 | 4.00 | 10.00 |
| Total | 100 | 7.2200 | 3.04704 | .30470 | 6.6154 | 7.8246 | 1.00 | 15.00 |

1) **Integration strategies:** This strategy includes integration strategies (vertical upper, vertical lower and horizontal). The aim of vertical upper integration is that a company tries to add its quality by buying distribution companies or retail companies and also tries to obtain ownership or increase control over the distribution system or retailers.

Vertical lower integration is one of the strategies in which the company tries to add to its property and control materials suppliers. Horizontal integration is implementation of one of strategies in which companies try to get the ownership of rival companies and add their control over them.

2) **Centralized strategies:** these strategies include strategies focused on penetrating the market, market development and product development. Manufacturers try to penetrate market by introducing new products or services to geographic areas and implement strategies based on market penetration. Product development means the implementation of one of strategies in which a manufacturer aims to add on its sales through improving or modifying products and present services.

3) **Diversity strategies:** Diversity strategies include several different strategies (homogeneous, horizontal and heterogeneous). By homogeneous strategies we mean that a company tries to add new products and services but they are related to old ones, and offers them to current customers. Heterogeneous diversity means that a company provides new products and services which are irrelevant (regarding their own products and services) to the market.

4) **Competitive strategies:** Competitive strategies get help from analysis of industry structure in future to determine competitive advantage. In this regard, Michael Porter's competitive strategies are considered as a benchmark. Strategies that Porter offers need different procedures, control processes and incentive systems (cost leadership, focused and distinct). By cost leadership we mean achieving resources and benefits by using leadership strategies.

Also, we want to achieve superiority in competition, using products or services with the least possible cost compared with our rivals. In centralised strategies, focus on specific groups of our customers, or part of the industry is enough or it benefits potential growth. Distinct strategies also offer special products or services. (David, 2005, pp: 132-136; jurisprudence, 2006, pp: 133-137; Jean and Dunnett, 1999, pp: 131-143).

2.5. Supply chain:

The concept of supply chain emerged when manufacturers experienced strategic partnerships with their suppliers directly (Haji Tarkhani, 2005). Supply chain requires all parts, including parts of a direct and indirect impact on a customer's request. As shown in Figure 4, Supply chain network includes not only Producer and provider, but also material handling, warehouses, retailers and their customers. Supply chain includes some attitudes as follows

Table 4. Chi- square test of first hypothesis

| | |
|--------|---------------|
| 97.359 | Chi-Square(a) |
| 4 | Df |
| .000 | Asymp. Sig. |

2.5.1. Supply chain processes attitude

There are two different ways of viewing formed processes in a supply chain, including push and pull phased press attitude. Push press phased attitude focuses on the processes that were formed within a range of supply chain courses in point of intersection between two consecutive points of each supply chain that has been formed and divided. Pull press attitudes consider processes that have been divided into two categories within the supply chain run by a customer order while push processes have been run and have been formed on the basis of customer orders' anticipation.

2.5.2. Supply chain processes phased attitudes:

Supply chain includes a string of processes and the flow that occurs inside and outside the different growth stages and also it includes a combination of

response to customer needs for production. In the five stages of a supply chain that is shown in the figure (5), all supply chain processes have been divided into the four-stage processes of order, replacement, construction and buying.

Table 5. (ANOVA) variance analysis test of second hypothesis

| | Sum of squares | df | Mean Square | F | Sig. |
|----------------|----------------|----|-------------|---------|------|
| Between Groups | 627.638 | 3 | 209.213 | 116.698 | .000 |
| Within Groups | 136.250 | 76 | 1.793 | | |
| Total | 919.160 | 79 | | | |

All of the processes in a supply chain have been divided into the binary categories of one or two of the respective components that ultimately depends on customers' demand. Pull processes are run in order to achieve a response to customers' order. The run time of a push process is not a recognised demand and must be anticipated. A supply chain looks like a mail order to a company like LL.Bean that is shown in figure (6) (Chopra and Mi Dale, 2004).

Table 6. (ANOVA) variance analysis test of third hypothesis

| | Sum of squares | df | Mean Square | F | Sig. |
|----------------|----------------|----|-------------|--------|------|
| Between Groups | 740.060 | 4 | 185.05 | 98.137 | .000 |
| Within Groups | 179.100 | 95 | 1.885 | | |
| Total | 919.160 | 99 | | | |

2.5.3. Organization's strategy against supply chain:

Organization strategy against supply chain is fully connected and related to the overall strategy of the organization and its subsystem. So, firstly the structure of organization's strategy should be determined according to its focus on the market or operations, product or process and then according to this strategy structure, organization's strategy against supply chain should be determined (especially activities related to supplying materials).

In general, the strategy structure can be described as four attitudes bellow: A. Action-oriented strategy: In this type of attitude we try to overcome problems of the organization by changing or improving conditions in the process of innovation (technology) and improvement or innovate in the product; B. Market-oriented Strategy: In this view, the organization constantly reviews and analyzes situations and opportunities in the market; C. Bureaucratic dynamics (product-oriented): In this view, organizations emphasize on product, they are identified and isolated based on the importance of activities and responsibilities conferred to the personnel. D. Group dynamics (Process-oriented): In this view the emphasis is on a process in which the organization's activities are based to be performed; E. Relationship with suppliers: Regarding the capability and interference with the chain of suppliers, there are three categories of: traditional providers, related suppliers and colleague suppliers, and then the needed decisions are made (Farshchi, 2006).

2.6. Supply Chain Inventory:

Supply chain inventory includes a separate communication between the external activities of organization and decisions that lead to the alignment of the Stock (Gerard and Marshal, 2000). Some parts and concepts of warehouse supply chain are as follows:

2.6.1. Supply chain inventory Management:

It includes the use of information technology in order to give shares to companies in demand and inventory control in the warehouse.

2.6.2. Information sharing:

Information technology is a significant effect of the supply chain. Sharing the whole information provide data for all suppliers as listed below: A - improvement and quantity of order policies B – improvement in decisions. Also, sharing information can make the best policy to order (Gerand & Marshal, 2000).

2.6.3. Inventory optimization applications of stock:

This application is in the supply chain for required change in inventories, to serve the total demands of customers by using full capacity and inventory.

2.6.4. Inventory optimization applications in warehouse:

Warehouse Optimization is a part of analytic applications to choose a supply chain to support and make decisions in different times. So that in optimizing the design of the value chain, changes in demand for products, manufacturing or transporting or delay, the threat within the supply chain based on an internal factor can be used. Also a lot of capabilities have already been considered to support multiple

programming to optimize the supply chain for a wide range of investment and the stock.

2.6.5. Performance applications Optimization of warehouse:

For each primary commitment to form warehouse optimization data there is an optimization analysis. Internal data are commonly used to anticipate domestic production or demand design in scheduling; overall design and layout value chain (suppliers, manufacturers, distribution centres and customer locations), plus replacing repetitive work; cost data (products, production transportation and storage); the purpose of service levels or punishment factors and budgets limits are applied (Simonellis et al, 2009).

2.6.6. Dependence of supply chain inventory :

Supply chain inventory examines interactions between different decisions in planning and deals with three types of dependency resulting from the nominal demand, time delays and services. Demand dependency is depended to three types of up and down rings of the supply chain demand. (Yung Hufu, 2004). A selection of applied researches that were done on the subject is as follows:

Martin et al (2001) have investigated highlighted points of multiple strategies in a research entitled "customer-friendly production and production strategy", regarding flexible production strategy literature, swift production and aspects of industrial marketing. In identifying customer-friendly problem solving situations and different kinds of customized product selection some factors are taken into consideration. Showing significant relationships between designing activity and production volume and excellence among the products that customized products are selected from among them have been studied. Stone - Jay et al (2003) conducted a research entitled studying Effect of strategies in tools application of supply chain. In this research the objective was the analysis of determining the strategies used in management tools of supply chain during the supply parts. Analyses are based on internal interviews of two supply chains in Hungarian automatic industry, where the results of the topic protect the relationship between supply chain strategy and tools (composition and participation). Also alongside the main aim, an attitude about the past, present and future Hungarian automatic industry was presented. (Jenci, 2003). Rotori et al (2005) provided a research entitled "an algorithm for evaluating different warehouse supply chain planning in Sri Lanka". This research studies the purpose of warehouse supply chain planning that includes a manufacturer, distributor and retailer. An algorithm is given in order to evaluate the whole system based on minimal costs of development. This algorithm includes investment in warehouse supply chain, supply chain ordering / set external costs and

supply chain storing. The study findings indicate an algorithm to different evaluations of order, production quantities and inventory, and measure the level of service by any number of inventories that is maintained in the supply chain (Rotor et al, 2005). Yong Hui et al (2004) provided a research entitled "a framework for supply chain alignment". The purpose of this study was a traditional warehouse supply chain, which in most cases express a separate communication between the external activities of organization and a week which led to the warehouse supply chain alignment and this relationship depended to a large number of non-alignment. The results of this study indicate an index for the coordination of supply chain through the maintenance costs (Yong Hui, 2004).

Gerrard Bi et al (2000) provided a survey entitled "supply chain inventory management and sharing in value of information". In traditional supply chain inventory management, orders are done from modified corporate data, but now they allow cheap sharing of order to gain technology information quickly to share the demand. The study mentioned includes a unilateral processing. Warehouse maintenance costs and extra costs incurred due to the return of the products are present in this supplying chain inventory. This research was done to compare the present policies with the traditional ones in which it was impossible to share the overall policies but it was possible to make benefits from the data. Also, it is determined that sharing the data with new information technologies causes the cheap and convenient access to ordering processes which causes shorter delays in deliveries of small amount orders. The results suggested that fostering the implementation of information technology and lowering the physical transformations of the goods through the use of a supply chain is more meaningful than the present technology in current data.

3. Research questions

The questions of this research are as follows:

- 1) Is there any relationship between manufacturer product strategy and hierarchical (push) structure?
- 2) Is there any relationship between manufacturer product strategy and supply chain inventory?
- 3) Is there any relationship between flexible manufacturing strategy and supply chain inventory?

4. Methods

The statistical society used in this research include, marketing managers, production and financial managers and industry engineers.

The samples in this research were chosen from among the scholars in different parts of industry who are working in production management, financial management, industrial management and marketing departments of different firms and the case sample

comprised warehouse suppliers' chain of the firms. The number of managers mentioned above is 25 that were chosen as our statistical society. Since our sample in this research includes marketing, production, financial and industrial engineering managers, we can achieve 95% assurance of the resulted findings which is applicable for all of our statistical society.

$$n = \frac{N \left(Z \frac{\alpha}{2} \right)^2 pq}{e^2 (N - 1) + \left(Z \frac{\alpha}{2} \right)^2 pq} = 20$$

Also, it should be mentioned that our sampling method among statistical society has been random. We have used questionnaires to collect data. The questions related to questionnaires were posed regarding problem statement, research goals and its hypotheses (Hamidi, 2008). In this research Kronbach alpha coefficient was used to identify questionnaires' consistency. Thus, the questionnaires were distributed among management, production, marketing, financial and distribution managers and they were collected after completion. Then the results were analyzed using SPSS16 software in a table shown in appendix 2. The

calculated result of Cronbach alpha coefficient for this research was 0/855 which shows the strength of our questionnaires' consistency.

5. Results

In order to analyze the resulted data, main criteria and the distribution of questionnaires' questions and statistical hypotheses' tests were calculated as follows:

5.1. Central criteria and questionnaires questions' distribution:

Central criteria and questionnaires questions' distribution of each question of hypotheses of 1 to 3 have been shown in tables 1 to 3, respectively. According to data presented in tables 4 to 6, it can be seen that based on viewpoints of those who responded the questionnaires in different parts of production, marketing, financial and industrial engineering department who took part in this research, the average questions related to the first, the average of Observed 115 and Expected 0.78, and second and third hypotheses average mentioned the 8/86, and 4/16 with standard deviations of 1/9, 2/02, and 5/05, respectively.

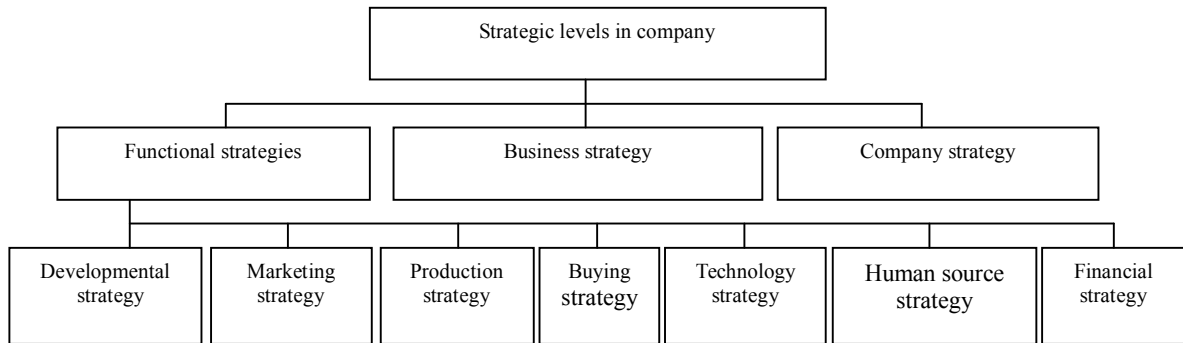


Figure 1. Strategic levels in company

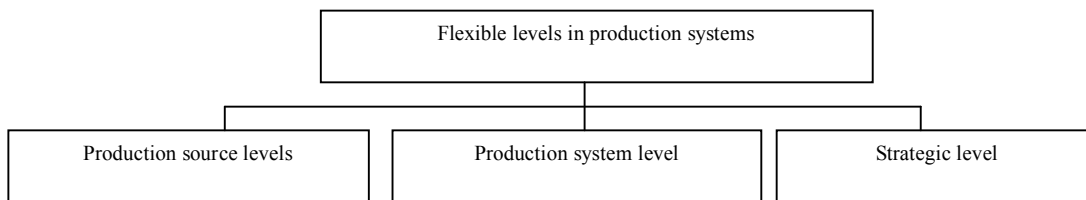


Figure 2. Flexible levels in production systems

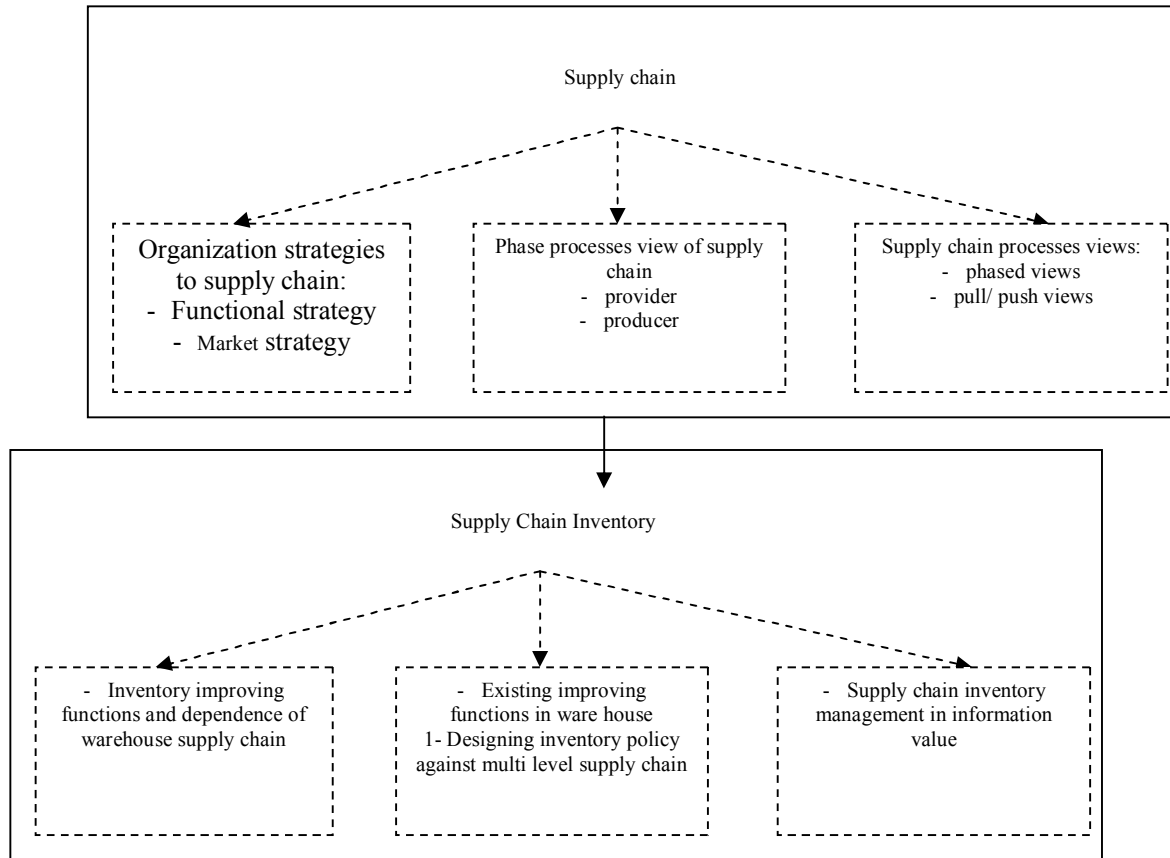


Figure 3. Theoretical frame of survey

5.2. Testing statistical hypotheses:

First each of the three research hypotheses mentioned above were defined as (H_0 , H_1). To test the first hypothesis, Chi-square test was used and in order to test the second and third hypotheses, variance analysis test (ANOVA) was used.

5.2.1. Testing the first Hypothesis:

H_0 : There is not any relationship between manufacturer product strategy and hierarchical structure.

H_1 : There is a relationship between manufacturer product strategy and hierarchical structure.

According to the data shown in the table 4, it can be seen that based on Chi-square test 97.359, and the meaningfulness level equals $P=0.000$. Regarding the fact that meaningfulness level is above %5, H_0 is rejected and H_1 is accepted.

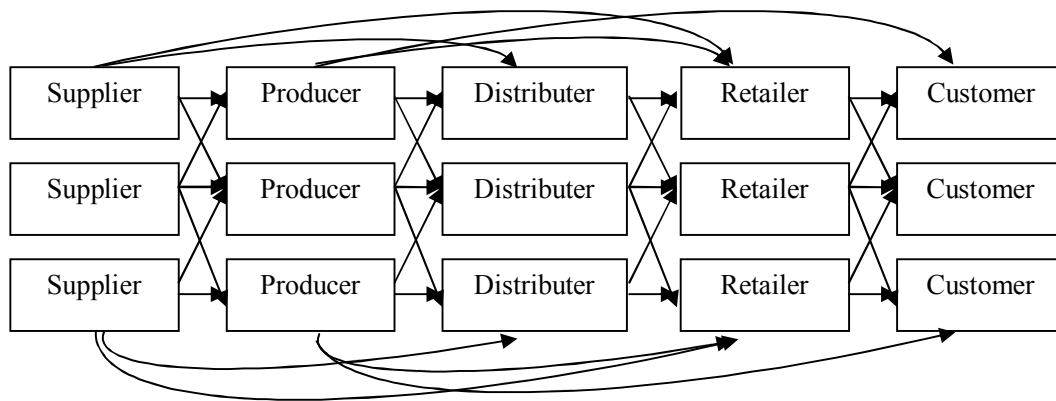


Figure 4. Supply chain network

Accordingly, Iran Pump Company should consider team work very important and use this strategy to achieve success. Thus, Iran Pump Company should not use cost leadership strategy which emphasizes on the protection of its competition development compared with other rivals which produce products with lower costs.

5.2.2. Testing the second Hypothesis:

H_0 : There is not any relationship between manufacturer product strategy and warehouse supply chain.

H_1 : There is a relationship between production manufacturer strategy and warehouse supply chain.

According to the data shown in the table 5., it can be seen that based on variance analysis test, the F calculated for the second hypothesis equals 116/698 and the meaningfulness level equals 0/000. Regarding the fact that meaningfulness level is below %5, H_0 is rejected and H_1 is accepted. Thus, Iran Pump Company should permanently use this strategy in order to optimize its warehouse supply chain to share the supply chain and share the information.

5.2.3. Testing the third Hypothesis:

H_0 : There is not any relationship between flexible (pushing) production strategy and warehouse supply chain.

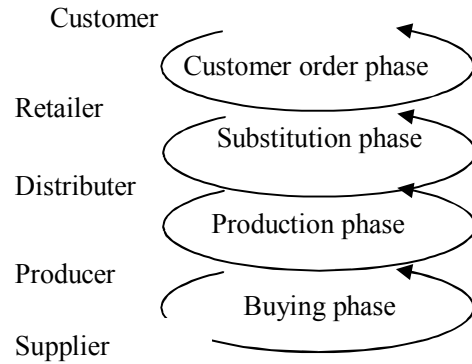


Figure 5. Pull/ Push view of supply chain processes

H_1 : There is a relationship between flexible (pushing) production strategy and warehouse supply chain.

According to the data shown in the table 6., it can be seen that based on variance analysis test, the F calculated for the second hypothesis equals 93/137 and the meaningfulness level equals 0/000. Regarding the fact that meaningfulness level is below %5, H_0 is rejected and H_1 is accepted.

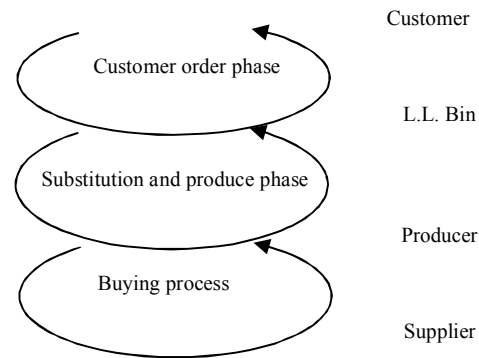
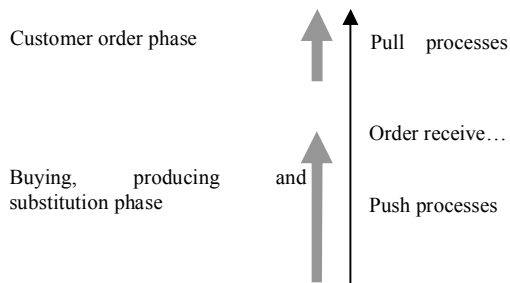


Figure 6. Pull/ Push view of supply chain processes

Thus, Iran Pump Company should permanently use group dynamics strategy which emphasizes on activities in which the organizational structure is organic in it and the internal responsibilities are delivered to groups and the personnel participation in improving production process design to satisfy customers' needs is significant. On the other hand, this prevents compiling the materials in the warehouse and there would be no problems between firm's suppliers in warehouse supply chain and the firm, so time delays and maintenance costs will be removed.

6. Conclusion and suggestions

Based on the analyses, it is concluded and suggested that:

There is not any relationship between manufacturer product strategy and hierarchical (push) structure; It is suggested that the firm should use production timing processes in order to maximize the orders and to lower its costs it should use phased supply chain processes. There is a relationship between manufacturer product strategy and warehouse supply chain. Accordingly, the firm should use process-oriented strategy with variable conditions in

the two cases below: improvement or innovation in product process (technology) and improvement or innovation in product. Thus, it is suggested that using more of this strategy will create innovation and creativity among the staff and scholars in production part and it consistently will try to change the status of manufactured products and will present a product to the market which will surprise the consumers. And this product will achieve the highest level regarding the quality and novelty of its usage. Also the firm will benefit flexibility in its production program and finally it will move forwards both in production technology process and also in product innovation. In such a situation, the firm suppliers' chain is included in a network structure in which is adjusted with decision-making processes vertically and horizontally with high levels of isolation. There is a relationship between flexible (pushing) manufacturing strategy and supply chain inventory. Regarding the fact that flexible strategy application is common among a vast variety of the products, the introduction of new products and the rapid change of products and satisfying the customers' demands is very effective. Thus, the firm should use long-term contracts with its suppliers, deliver products in line with the production pace, permanently decrease the warehouse inventory and delivering time (for both purchaser and suppliers), permanently and cooperatively improve the quality, designing the quality needs cooperatively, designing the products and the process by the cooperation of the suppliers, and it is suggested that it is better for the firm to use these strategies rather than using product-oriented strategy which emphasizes on the products and all predetermined activities. Also, the firm should use more strategic (external) flexibility which includes the flexibility of outputs in relation with the firm's products. Because if the firm is flexible dealing with the tastes of its consumers, firstly the customers will show more eagerness to purchase the products manufactured by the firm and secondly its products will be more noticed by the customers compared with the products manufactured by other similar firms.

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