

PHYSICAL, CHEMICAL SCIENCES AND ENGINEERING

Manuscript info:

Received June 12, 2018., Accepted July 17, 2018., Published August 20, 2019.

EFFECT OF SUPPLY CHAIN OPTIMIZATION IN THE OIL INDUSTRY

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<http://dx.doi.org/10.26739/2573-5616-2019-8-13>

Abstract: Optimization is recognized as main tool for the oil companies to achieve competitive advantage. The signification of the oil industry's impact on the global economy is obvious. Oil supply chain management has to solve a lot of challenges caused by the nature of the supply chain in the oil industry such as complexity, inflexible characteristics, time delay and lack of transport facility at the different stages in the supply chain, rigid payment procedures and limited primary distribution capacity. Other challenges are political or economic changes which have an impact on the price of the oil. Finding options for optimization of the oil supply chain is vital because any cost saving increases the profitability for the oil companies therefore optimization is at the center of attention in the oil supply chain management.

Key words: Optimization, Oil industry, Supply chain, Challenges, Achieve

Recommended citation: Hadi Erfani Hadierfani, Dr. Sushma Singh. EFFECT OF SUPPLY CHAIN OPTIMIZATION IN THE OIL INDUSTRY. 7-8. American Journal of Research P. 138-145 (2019).

Introduction:

Supply chain management:

Different academicians have defined supply chain management in different ways and from different perspectives. Definitions given for supply chain management differ across the authors and are categorized into three main classifications; management

philosophy, implementation of a management philosophy, and a set of management processes (mentzer, dewitt, Keebler, min, nix, smit & zacharia, 2001).

The alternative definitions and the categories they represent suggest that the term supply chain management presents a source of confusion for those involved in researching the

phenomena as well as those attempting to establish a supply chain approach to management (Meltzer et al, 2001). Other individuals and groups define supply chain management in some other ways. Langley Coyle, Gibson, Novak and Braid (2009) define supply chain management as an art and science that involves the integration and flows of the three components in the supply chain pipeline that is: products, information and finance starting from the suppliers' ending with the ultimate consumer.

Assey (2012) mentions that supply chain management is focused on the management and examining of the network within the supply chain for gaining a better cost saving and providing a better customer service. Ganeshan and Harrison (1995) define supply chain management as a network or chain of facilities and distribution options that execute the process of the obtainment of products, the transformation of these products into intermediate and finishing goods and the distribution of these finishing goods to customers.

The oil industry:

The raw materials of the petroleum industry are crude oil and natural gas. The crude oil and natural gas are found either deep underground or in offshore areas. These are used for the production of petrochemicals and oil derivatives. After crude oil is accessed, it goes through a distillation process and different fractions of it are produced.

Fuel gas, liquefied petroleum gas,

kerosene and naphtha are examples of the main fractions of the crude oil which are transferred to the refineries as a feedstock. That is following by the cracking process and new products can be extracted for the petrochemical industry such as Olefins and Aromatics, Ethylene, Propylene, Butadiene, Benzene, Toluene and Xylene. Petrochemical plants can produce more specified products such as plastics, soaps, detergents and healthcare products, synthetic fibers, furniture, rubbers and paints (Hussain et al, 2006)

Hilmola (2011) mentions that in the recent decade global economic trends and the oil industry has turned out to be inseparable. They have a great impact on each other. The supply of oil and gas has become a necessity for the nations' economy and also shows a growing demand tendency. (Hilmola, 2011; Tierney, 2004).

With globalization the trade barriers have also been eased for smoother trade and technology development has clearly intensified (Jenkins & Wright, 1983). Hall (2002) notes that faster delivery, reliability and lower cost have also appeared as a need from the customers' point of view. He also stresses that all these factors create a strong competition among the oil industry players and to be in the 'game' supply chain management plays an indispensable role. In a competitive market the companies aim to be more effective, more efficient and more profitable than their competitors. Hussain et al

(2006) supports the importance of supply chain management within the industry as the oil companies of today believe that the competition occurs on their supply chain level rather than within individual companies.

Complex supply chain:

Hussain et al (2006) describes how the whole supply chain in this industry as very complex compared to other industries. The crude oil has to make a long journey from the point of production to the refineries. Long distance results in a long lead time of several weeks and in numerous players in the supply chain. The production is concentrated in certain areas but the product itself is demanded all over the world. The refinery process is a complex and capital-intensive part of the chain. The refined products are distributed either by road, water, rail or pipeline (Hussain et al, 2006).

Supply chain optimization in the oil industry:

As it was already mentioned, the analysis concentrates more on the downstream segment since this segment bears a greater potential for enhancing the flexibility and for cost saving (Jenkins & Wright, 1998; Gainsborough, 2006; Hussain et al, 2006). It should not also be forgotten that first of all the objective of optimizing oil supply chain has to be clarified. Normally it is aligned with the supply chain strategy and aim to achieve profit maximization by being cost efficient and satisfying customers (Jasuja et al, 2009). States that optimization is also a value

creating opportunity for the oil companies as well as for gaining competitive advantage.

Supply chain optimization is the biggest opportunity for most companies to significantly reduce their cost and improve their performance (Ratliff, 2007).

The optimization of the supply chain helps firms make the right decisions in view of the fact that every company has its distinctive resources, opportunities and limitations. On top of these, it is mentioned that supply chain optimization focused on growing and maximizing the firms' returns on assets (Brayan & McDougall, 1998).

Materials and Methods:

The framework used for this review is based on Brayan and McDougall's (1998) five activities of supply chain optimization. Due to the lack of research on this topic, not many sources can be found which actually give a theoretical background for optimization of supply chains. Brayan & McDougall (1998) point out that supply chain management and advanced planning schedules are the key fundamental of supply chain optimization. On the other hand they add that there are five types of activities that are involved in the supply chain optimization process as mentioned below:

1. Planning
2. Scheduling
3. Execution
4. Tracking
5. Adjustment

The above five activities and their respective opportunities are applied to all course of actions (strategic, tactical and operational) as well as to all four basic functions such as procurement, refinery, distribution and marketing (Brayan & McDougall, 1998).

1. Planning:

According to Camillus (1986) planning can be defined as the act of thinking ahead or making decisions on what you should accomplish attain or achieve. Planning is to decide in advance what has to be done, when, how and by whom it has to be done and how the results are to be evaluated (Taloo, 2007, p.304).

Piotrowski (1992) mentioned that planning is important because it offers managers a procedure to make decisions built on knowledge and information which in the long run saves time and money. In addition to this, Piotrowski (1992) adds that planning is helpful in a way that it helps to develop standard of performance. So planning is a written document of plan and strategies of every stage of supply chain management.

2. Scheduling:

Scheduling comes right after the planning has been approved by the management (McCarthy & lui, 1993). It basically breaks the plan down into daily or weekly basis. Scheduling, just like planning has to extend to all functions in the supply chain from the procurement to the distribution. The term scheduling refers to the allocation

of resources in a specific period of time to execute or carry out certain tasks or operations. The significance of good quality scheduling strategies in production environments in today's market where there is a high level competition cannot be overstressed. The need to react to market demands rapidly and to run plants efficiently gives rise to complex scheduling problems in all but the easiest production environments (McCarthy & lui, 1993). So for a good chain management, schedule of activities are expected in advance which saves time and helps in effective management.

3. Execution:

Execution stage comes after the plan and schedule are actually materialized. Sehgal (2009) defines it form supply chain perspective. Execution gives a support to the process that assist in running day to day operation and activities of a company. These processes commonly depend on the outcome of the supply chain planning processes, so the implementation from a planning process is highly required. Supply chain execution has two main benefits: it makes sure that operation within the supply chain are arranged in a line with the plans, and it also ensures a feasible plan of execution if the higher level planning was carried out with appropriately modeled constraints (Sehgal, 2009). To execute a networking in a unique Global perspective is required.

4. Tracking:

Tracking is basically about the performance measurement.

Gainsborough (2006) Points out that the whole supply chain optimization process goes from forecasting, planning and scheduling to the execution. He emphasizes that optimization is successful when expert analysis the result and actually the optimized plan achieves the expected return on investment (ROI). But to achieve this, Ratliff (2007) Explains that objectives have to be determined and they have to be measurable at the beginning of any optimization because of the dynamic nature of the supply chain, the optimization needs place for improvement by monitoring data and optimization models. It needs to use benchmarking, key performance indicators and comparing the optimization results to the benchmarking (Ratliff, 2007). Tracking also requires technology & automation.

5. Adjustment:

Adjustment is strongly related to the tracking. (Sople (2012) states that adjusting is important because in today's market where is increasing variety in customer needs, companies need to quickly adjust their supply chains to meet the customer's requirement or demand leading to a more sustainable competitive advantage. This could not be possible by only offering better customer value propositions, but the firms need to adopt a unique business system to support it (Sople, 2012). Inventory adjustment, positive adjustment and flexibility are must for optimization of supply chain in the oil industry.

Research Methodology:

Kothari (2004) defines research methodology as a way of finding a solution for research problems or it can be described as a science that deals with who research is carried out scientifically. Kothari (2004) points out that research methodology is important for researchers in order them to do research in a way that highlights and gives essential training in collecting material and arranging and putting it together for carrying out research. Kothari (2004) also adds that there are two basic approaches to research: qualitative research and quantitative research. For this research qualitative research is applied. The definition and description of qualitative research is explained in detail as follows.

Qualitative research is the collection, analysis and interpretation of data. Data that cannot be meaningfully summarized cannot be the part of quality research. Qualitative research basically depends on the gathering of qualitative data (Johnson & Christensen, 2012). Neeragaard and Ulhoi (2007) define qualitative research as a research that focuses on a multi method approach that includes as interpretive and naturalistic view of its subject matter. Qualitative research is concerned with qualitative observable fact or in other words a phenomenon that contains quality or kind (Kumar, 2008). Beije (2010) illustrates that in qualitative research the research question are carried out in a flexible

manner allowing one to get in touch with the people concerned to a degree that is essential to grasp what is being carried out within the field.

Types of data:

Stevenson's et al. (2006) state that there are two types of data:

Primary data: data that is gathered by a researcher for the first time for a particular ongoing research project. According to Guffey (2010), primary data is that collected through firsthand experience. Primary data can be gathered by applying either of the two basic research methods, qualitative or quantitative (Stawarski & Particia, 2008).

Secondary data: data that has been formerly gathered by other researchers for other reasons. Guffey (2010) mentions that secondary data results from reading what others have experimented with and observed. In addition to those, Guffey (2010) adds that secondary data is simpler and has lower cost to develop and to use than primary data which might mean interviewing large groups and distributing questionnaires.

For this research the authors used both, primary data collected through interviews and to get a relevant and reliable data to make a good research, secondary data from different sources such as books and articles as a supportive data has also been used, which helped in building the frame of reference for the study and gave a guidance in making analysis with the finding systematically and properly.

Methods of data collection:

Philips and Stawarski (2008)

illustrate that there are different ways of collecting qualitative data among these, the most commonly used ones are three: interviews, focus groups and observations. Kothari (2004) state that for selecting the appropriate method for data collection, a researcher should keep in mind the following key factors:

1. Nature, scope and object of enquiry: this is the most important factor that influences or effects on making a choice about the particular method to be implemented. This factor also plays an important role in making the decisions on what type of data to be used, primary data or secondary data.

2. Availability of funds: availability of funds plays a big role for selecting the appropriate data collection method. When there is limitation of fund the researcher has to select a chapter method for collection of data even though it might be less efficient and effective method compared to other costly methods.

3, time factor: it is important for a researcher to keep in mind the availability of sufficient time before making a decision on what type of method is to be used for the data collection.

4, precision required: being precise is another key factor to be taken into account by researchers when selecting the method of collection of data.

Conclusion:

The literature review shows the main characteristics in the oil industry which are responsible for the high level of uncertainties.

Complexity and inflexibility of the oil supply chain raises numerous constraints and challenges such as time delayed involvement of many modes of transportation, rigid procurement and fixed shipping capacity. Uncertainties also include the impact of economic and political situation on the oil industry which are reflected by price and demand fluctuation. Seeing the several constraints involved in the oil industry, it is understandable that common characteristic of oil companies must be used in a vertically integrated way by the industry in order to handle complexity and to have a better control over the chain.

Regarding the supply chain, the refinery function stands as a unique stage particular to oil industry. It also

increases the complexity and tightly operates together with the marketing and logistics. The size of the oil industry and the amounts of money involved in the oil business justify the significance of efficient supply chain, focus on cost efficiency and profit maximization. Achieving these goals the optimization plays a key role which is based on very sophisticated mathematical programming and its solutions. Optimization is not just used to increase the profit but it is also used for the management of resources and avoiding threats by handling uncertainties. Uncertainties set not only constraints but increase the options for solutions. Therefore, optimization aims to find the best possible solution for handling any constraints.

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