Information Sharing and Advanced Planning in Performance of Saipa Diesel Company Supply Chain: SCOR Approach

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A R T I C L E   I N F O

A B S T R A C T

Background: Efficient supply chain management is a survival factor for a company and causes much rivalry benefits for it, and appropriate performance of supply chain plays an important role in success of a company from different aspects, especially its profitability. SCOR is a reference model, in which unlike other optimization methods, has no mathematical formula or heuristic solution to solve supply chain problems. **Objective:** looking into relationship between applying information sharing, advanced planning and their pursuant effect on SCOR indicators. For this purpose, we selected supply chain of Saipa Diesel Company as our case study. After identifying model indicators, we examined the effects of applying information sharing and advanced planning on SCOR indicators. A questionnaire was designed and filled and the data were statistically tested for collected data. **Results:** applying information sharing in addition to applying advanced planning have positive significant effects to improve SCOR. **Conclusion:** The outcomes of the research indicated that information planning mostly influences on logistic cost management. And also applying information sharing mostly influences on supply chain agility.

INTRODUCTION

Appropriate performance of supply chain plays an important role in success of a company from different aspects, especially its profitability. Therefore, applying supply chain assessment system is crucial. As often large Iranian companies' costs are high, lean production might be considered as a serious solution. Lean is a production practice that targets for elimination of resource costs other than customer would be willing to pay for. That is lean tries to preserve value with less work. Lean manufacturing is a management approach initiated by Toyota Production System (TPS) (Toyotism) in 1990s (Womack *et al*., (1990); Holweg and Matthias (2007)). It is also important to consider that supply chain would be JIT (Just in Time production strategy), efficient delivery and controlled distribution costs in lean production. Therefore, building a performance measurement system in supply chain can efficiently help us achieving just-in-time production and delivery practices with the lowest possible costs (Ahmadi, 2005).

Efficient supply chain management is a survival factor for a company and causes much rivalry benefits for it. Suppliers confront increasing pressures on flexibility, variety, and time and value basis. Performance measurement in supply chain is a process of analysis to decrease costs, risks and provide constant facility to improve value creating and organizational operations (Ahmadi, 2005). On the other hand it helps a company with following abilities:

✓ Verification, evaluation and control of performance will be under the control of company.

✓ Able to gain profit using the same methodology and scales in an organizational evaluation.

✓ Able to make decisions within systemic framework. Decisions made in supply chain framework can lead to fulfill lean production purposes.

Supply Chain Operations Reference (SCOR):

Supply Chain Operations Reference (SCOR) was developed by Supply Chain Council (SCC) in 1996 (Persson, 2011). Performance attributes is a single classification dimension that SCC (2010) defined four metrics (Garcia *et al*., 2012). The model developed by members of the council on a volunteer basis to describe

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business activities associated with all phases of satisfying customer's demand (Hugos, 2011). SCOR (version 10.0) consists of four major components (Georgise *et al*.,2012) of:

−   Performance: Standard metrics to describe process performance and define strategic goals.
−   Processes: Standard descriptions of management processes and process relationships.
−   Best Practices: Management practices that produce significant better process performance.
−   People: Standard definitions for skills required to perform supply chain process.

SCOR is a reference model, in which unlike other optimization methods, has no mathematical formula or heuristic solution to solve supply chain problems. Instead, there are some standardized terms and processes to help to understand supply chain process. Different entities of supply chain can be demonstrated by configuring the processes and then be compared with each other. This allows the companies to (Hugos,2011):

✓   Evaluate the processes efficiently.
✓   Compare their performance with companies in and out of the industry.
✓   Follow specific competitive advantages.
✓   Set priority for the activities according to these evaluations.
✓   Quantify profits yielded by the changes.
✓   Identify the best software that meets requirements of a specific process

SCOR is based on 3 major pillars (Hugos,2011):

1-1 Process Modeling Pillar: by describing supply chains, the model can be used to describe simple or complex supply chains using a common set of definitions to understand the existing and future conditions based on five distinct management processes of: Plan, Source, Make, Deliver and Return. At this stage current conditions of company is identified and competitive advantages and changing business conditions are defined.

1-2 Performance Measurements Pillar: SCOR contains key indicators that measure the performance of supply chain operations. The metrics are used in conjunction with performance attributes. The performance metrics are derived from the experience and contribution of the council members. The performance metrics permit to analyze and evaluate a supply chains against the other in their competing strategies. Comparisons will be a base for future changes to improve the supply chain of a company.

1-3 The Best-Practices Pillar: SCOR defines a best practice as a current, structured, proven and repeatable method for making a positive impact on desired operational results. Once the performance of the supply chain operations has been measured and performance gaps identified, it becomes important to identify what activities should be performed to close the gaps to improve company operation indicators, inspired from the successful company's operations.

SCOR is based on five distinct management processes (Francis, 2007):

−   *Plan:* Companies need a strategy for managing all resources that go toward meeting customer demand for their products and services.
✓   Balance aggregate demand and supply to develop a course of action which best meets sourcing, production and delivery requirements.
✓   Managing commercial regulations, supply chain operation, collecting data, inventory, stocks, transportation and planning qualification.
✓   Adjusting supply chain plan with financial plan.
−   *Source:* Processes that source goods and services to meet planned or actual demand. Company chooses suppliers to deliver the goods and services it needs to produce the products. Supply chain manager develops a set of pricing, delivery and payment processes with suppliers and create metrics for monitoring and improving the relationships. It includes the processes for managing the goods and services, inventory, receiving and verifying shipments, transferring to manufactories and authorizing supplier payments as:
✓   Scheduling deliveries, receipt, and verification and transferring product.
✓   Identifying and selecting supply sources.
✓   Managing commercial regulations, evaluation of suppliers operation and data protection.
✓   Controlling inventories, stocks, suppliers' communication network, regulations for incoming and outgoing products and suppliers' obligations and commitments.
−   *Make:* processes that transform product to a finished state to meet planned or actual demand. At this stage, supply chain managers schedule the activities necessary for production, testing, packaging and preparation for delivery. This is the most metric-intensive portion of the supply chain where companies are able to measure quality levels, production output and worker productivity.
✓   Scheduling production activities, testing, packaging and preparation for delivery
✓   Engineering the product based on the order
✓   Managing trade laws, operations, data, under working process stocks, facilities, transportation, production network.
−   *Deliver:* Logistics; that company coordinates the receipt of order from customer, develops a network of warehouses, picks carriers to get product to customer and setup invoicing system to receive payments:
✓   Coordinating receipt of orders from customers, pricing and picking carrier product to customers.

✓ Developing warehouses from receiving time and transferring product for loading and sending.
✓ Receiving and verification of the product in customer's website.
✓ Managing commercial regulations regarding receiving and sending product, operation, data, inventories, stocks, transportation, product life cycle and regulations regarding incoming and outgoing products.

− *Return:* Supply chain planners have to create a responsive and flexible network for receiving defective and excess products back from their customers and supporting customers:
✓ All steps of returning defective product from the source of identified deficiency, transportation, and issuing license for returning the product, receiving and transporting defective product.
✓ All steps of returning repairable product from the source of identified deficiency, transportation, and issuing license for returning the product, receiving and transporting repairable product.
✓ All steps of returning excess product from the source of identified deficiency, transportation, and issuing license for returning the product, receiving and transporting excess product.
✓ Managing commercial regulations regarding returning defective, repairable or excess products, collecting data, returning inventory, stocks, transportation, configuring requirements of network.
Key indicators of operation evaluation for supply chain management in SCOR model are listed below:

Table 1: key indicators of operation evaluation in SCOR model.

Row	Operation key indicators	Scope				
		Inside scope		Scope of customer		
		Capital	Cost	Flexibility	Responsibility	Reliability
1	Delivery operation					*
2	Orders delivery operation					*
3	Orders fulfillment					*
4	Supply chain responsiveness				*	
5	Production flexibility			*		
6	Logistic management aggregate cost		*			
7	Workers added value productivity		*			
8	Guarantee cost		*			
9	Cash to cash cycle time	*				
10	Days of supplying inventory	*				
11	Capital turnover	*				

Ref.:Bolstorff and Rosenbaum, 2003

Information Sharing in Supply Chain:

Supply chain is a system consists of interdependent members, such as suppliers of raw materials, producers, distributors and retailers that every one of them has series of unique information regarding their works. Lack of correct information for every supply chain participants decreases the whole supply chain system efficiency. For example bullwhip effect is an observed phenomenon in forecast-driven distribution channels. It refers to a trend of larger and larger swings in inventory in response to changes in demand, the effect is that variations are amplified as one moves upstream in the supply chain (further from customer). This example can clearly demonstrate phenomenon observed because of incorrect information of every supply chain participant. Hence, information sharing is basic to effective coordination in a supply chain. Many studies have found out that information sharing has great impact on supply chain performance. Information sharing enables companies to make better decisions in their operation leading to better resource utilization and lower supply chain costs.

There are many theoretical and empirical studies conducted focusing on benefits of information sharing in supply chain. But only a few of them have considered the characteristics of information sharing in supply chain. One of these characteristics is that every participants of supply chain might show self-interest behaviors, if we don't consider such behaviors in information sharing, we might not benefit results of information sharing in supply chain. (Sahraeian, 2004).

A supply chain is a system of companies, people, technology, activities, information and resources involved in moving product or service from supplier to customer. Supply chain activities transform natural resources, raw materials and components into a finished product that is delivered to an end customer. Supply chain management is management of a network of interconnected businesses involved in the provision of product and service packages required by the end customer in supply chain. If all relevant information is accessible to any relevant company, every company in supply chain has the ability to help optimize the entire supply chain system. Supply chain management purpose is to manage relations between every participant of supply chain through directorial and operational activities. Supply chain management comparing to traditional management that managed each and every one of members, focuses on managing relations (Ding *et al*., 2011).

Methodology and Result:

In this paper we are studying the role of information sharing and advanced planning to improve SCOR model indicators. For this purpose following steps were taken:

✓ Referencing to libraries, websites and databases: First, was to find out essential information basis and also to identify evaluation indicators of SCOR model including 11 indicators through library search:
– Delivery operation
– Ordering delivery operation
– Order fulfillment
– Supply chain responsiveness
– Production flexibility
– Aggregate cost of logistic management
– Workers added value productivity
– Guarantee cost
– Cash to cash cycle time
– Days of supplying inventory
– Capital turnover

✓ Questionnaire (to collect data): A questionnaire on "importance of applying information sharing and advanced planning to improve supply chain operation" was provided by supply chain experts. Indicators used in the questionnaire were assessed by experts. Stability of the questions was tested by Cronbach's alpha coefficient of 0.872 through SPSS software, which indicated stability of research questionnaire.

Statistical sample includes of supply chain of Saipa company experts. First, Saipa supply chain experts were identified. Number of these experts was about 37. Aforementioned questionnaire was distributed among them, and 30 experts' filled questionnaires were analyzed. To analyze the information related to role of information sharing and applying advanced planning to improve operation of SCOR model indicators, was conducted by t-test through SPSS software.

Results:

Table 2: Importance of applying information sharing in SCOR model indicators improvement.

Indicators Name	Cumulative Weighted Frequency	Indicator value
Delivery operation	250	8.33
Ordering delivery operation	212	7.07
Order fulfillment	223	7.43
Supply chain responsiveness	258	8.60
Production flexibility	237	7.90
Aggregate costs of logistic management	237	7.90
Workers added value productivity	230	7.67
Guarantee cost	185	6.17
Cash to cash time	209	6.97
Days of supplying inventory	223	7.43
Capital turnover	153	5.10

Table 2 illustrates the role of applying information. In order to study role of information sharing in SCOR model indicators improvement, results of questionnaire were analyzed by SPSS software:

Table 3: Statistical Result of Role of Information on SCOR Improvement.

	Sample size	Sample mean	Standard deviation	t-statistic	Significance
Role of information sharing to improve SCOR model indicators	30	3.24	1.11	2.92	0.000

Table 4: Importance of applying Advanced planning in SCOR model indicators improvement.

Indicators Name	Cumulative Weighted Frequency	Indicator value
Delivery operation	236	7.87
Ordering delivery operation	238	7.93
Order fulfillment	208	6.93
Supply chain responsiveness	232	7.73
Production flexibility	243	8.10
Aggregate costs of logistic management	251	8.37
Workers added value productivity	244	8.13
Guarantee cost	172	5.73
Cash to cash time	197	6.57
Days of supplying inventory	228	7.60
Capital turnover	211	7.03

Considering that significance is equal to $0.000 < 0.05$, so the alternative hypothesis of applying information sharing to improve SCOR has a positive significant effect is accepted at 95% confidence level. To study the role of advanced planning in supply chain indicators improvement, the corresponding question of the questionnaire

was analyzed Information in table 5 shows the role of applying advanced planning on the above mentioned indicators.

Table 5: Table (3) Statistical Result of Role of Advanced Planning on SCOR Improvement.

	Sample size	Sample mean	Standard deviation	t-statistic	Significance
Role of Advanced planning to improve SCOR model indicators	30	3.28	1.35	2.43	0.000

Considering again that significance level is equal to 0.000 < 0.05, so the null hypothesis is rejected at 95% confidence interval and alternative hypothesis is accepted. That is, applying advanced planning to improve SCOR has a positive significant effect in Saipa Diesel Company.

Conclusion:

Supply chain consists of interdependent members, such as suppliers of raw materials, producers, distributors and retailers and every one of them has series of unique information regarding their works. Lack of correct information for every supply chain participants decreases the whole supply chain system efficiency. Supply chain manager has the ability to manage relations, coordination and integrity among all supply chain participant. Hence, supply chain manager should manage inter and intra supply chain collaboration.

Supply chain management compared to traditional management (that manages all of participants), focuses on relations between participants and looks for solutions to decrease supply chain costs efficiently, producing and distributing product, and increase flexibility and responsibility by modifying current processes. The other purpose of supply chain management is to produce a new product that can meet constantly-swing demands. For this purpose, companies such as Siapa Diesel Company should take appropriate decisions, benefiting supply chain technology and information systems which can help them to decrease supply chain cost and integrate their processes, through advanced planning.

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