

# A framework for Performance Evaluation of Industrial Organization

## إطار عمل لتقويم الأداء للمؤسسة الصناعية

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### المخلص

في الاقتصاد العالمي ، والبيئة التنافسية و الديناميكية ،تعتبر إدارة سلسلة الامداد عاملا استراتيجيا رئيسيا لزيادة الفعالية التنظيمية . و العديد من المنظمات لم تنجح في تعظيم إمكانات سلسلة الامداد الخاصة بهم لأنهم لم يضعوا مقاييس تقييم الأداء المطلوبة و الإجراءات اللازمة لدمج سلسلة التوريد الخاصة بهم ل تحقيق أقصى قدر من الفعالية والكفاءة. ويوجه هذا البحث إلى وضع إطار قادر على تقييم أداء المنظمة وإدخال نظام فعال لقياس الأداء تمكن إدارة المنظمة للتقييم ومراقبة و تحسين أداء المنظمة من أجل تحقيق أهدافها الاستراتيجية . فعندما يتم فهم متطلبات ومعوقات السوق يمكن لادارة المؤسسة محاولة وضع استراتيجية من شأنها تلبية احتياجات كل من اصحاب رؤس المال في عالم الأعمال و المستهلك النهائي.

### Abstract

In a global economy, competitive and dynamic environment, Supply Chain Management (SCM) is a key strategic factor for increasing organizational effectiveness. Many organizations have not succeeded in maximizing their supply chain's potential because they have not developed the required performance evaluation metrics and measures needed to integrate their supply chain to maximize effectiveness and efficiency. This search is directed to develop a framework capable of evaluating the organization performance and introduce efficient performance measurement system enabling organization management to control, monitor, and improve the organization performance in order to achieve their strategic goals. Only when the requirements and constraints of the market place are understood an enterprise can attempt to develop a strategy that will meet the needs of both the business success and the end customer.

### Keywords

Performance Measurement; Supply Chain Management; SC PE; framework

## 1. Introduction

In a global economy and competitive and dynamic environment, Supply Chain Management (SCM) is a key strategic factor for increasing organizational effectiveness. Industrial organizations around the world are realizing the importance of supply chains and the impact of their performance on the business. Therefore, for many reasons, improving supply chain's effectiveness and efficiency becomes a critical factor to remain competitive in a marketplace that is more and more global, and where competition is tougher and tougher. One of the reasons is that most of successful manufacturing organizations have an opportunity to achieve higher performance in pursuit of SCM (Cho et al., 2012). This also because effective SCM can lead to a

lowering of the total amount of resources required to provide the necessary level of customer service to a specific segment and improving customer service through increased product availability and reduced order cycle time while reducing costs (Banomyong & Supatn, 2011). To reach this goal, supply chain management comprises a wide range of processes, entities and management dimensions that act together to add value to customers and stakeholders. Its processes begin with the supply of raw materials, pass through manufacturing and follow the product until delivery to the customer; they include such activities as the planning and execution of materials purchasing, production and distribution. SCM also affected by another important entities such as suppliers and clients, and by other organizations and communities

that may influence decision making (Beamon, 1999; Chan, 2003; Gunasekaran et al., 2004; Kannan and Tan, 2005; Cagliano et al., 2006; Hult et al., 2006; Della Bruna Jr et al., 2014).

To reach the organization strategic objectives or ensure continuous improvement, the performance of the supply chain processes must be measured. Moreover, a process cannot be managed if its performance cannot be measured. To manage all the processes, entities and dimensions involved in the supply chain operations efficiently is not an easy task. This complex, conflicting and uncertain environment requires management tools that support the decision makers in identifying the relevant criteria of their operations, generate actions to improve their performance and thus increase competitiveness. Performance evaluation methodologies are capable of meeting these needs (Ahmad and Schroeder, 2003; Cai et al., 2009; Chan and Qi, 2003; De Toni and Tonchia, 2001; Jimenez and Lorente, 2001; Johnston and Pongatichat, 2008; Kannan and Tan, 2005; Ketokivi and Schroeder, 2004; Kleijnen and Smits, 2003; Lee, 2004; Lockamy and McCormack, 2004; Narashimham and Mahapatra, 2004; Staughton and Johnston, 2005).

The objective of this paper is to develop a supply chain performance evaluation model capable of reflecting the values and preferences of decision makers and of providing them with the support necessary to make decisions that improve their supply chain' operations. The rest of paper is organized in seven sections. In **Section 2**, the literature on SCPM is presented and performance measurement indicators. **Section 3** deals with the identification of criteria and metrics in the proposed supply chain performance evaluation framework. **Section 4** describes the implementation of the proposed framework through an industrial organization through a case study of automotive supply chain performance

evaluation. **Finally**, the paper concludes with a discussion of the framework results.

## 2. Supply Chain Performance Evaluation(SCPE)

This section summarized researches related to performance measurement at the supply chain, not at the individual company, level. The literature is used in providing the general structure and the need of supply chain performance measurement. It was a traditional way to evaluate any organization performance from financial view measures. In time, this aspect turned to be insufficient and had very narrow fake performance evaluation of how business run. Performance evaluation is a very strong management tool and has serious impact on management decisions and destinations. With that value and serious impact, organization management should give more attention to the selection of its performance evaluation indicators as it should be in balanced way between financial and non-financial measures.

It begin when Kaplan and Norton (1992), the balanced scorecard emphasizes a balance between the use of financial and nonfinancial measures to achieve strategic alignment. Most companies realize the importance of financial and non-financial performance measures; however, they fail to represent them in a balanced framework. (Gunasekaran, Patel, & Tirtiroglu, 2001; Gunasekaran et al., 2004) propose a framework for measuring the strategic, tactical and operational level performance in a supply chain. In addition, a list of key performance metrics is presented. They highlight that performance measures should deal with suppliers, delivery performance, customer-service, and inventory and logistics costs in a SCM.

Since that time the need to deal with performance evaluation frame work turned to be a multi-criteria decision making problem. Many researchers directed their effort to the selection of performance evaluation metrics and others were

interested in how to measure and compute the performance indicators. Another direction arose through the recent decay with how to make both previous points merges and help in strategic management decisions.

For instance, *Gunasekaran et al. (2001)*, on the other hand, suggested “time” has to be used as a strategic metric in performance measurement. This is because controlling and compressing time shall increase quality, reduce costs and enhance the responsiveness to customer demands and overall productivity. This model is based on identify, plan, source, make or assemble and delivery as links of supply chain. *Beamon and Chen (2001)* displayed a regression analysis methodology to evaluate the supply chain on the basis of average inventory cost, average transportation cost, etc. *Taylor (2004)* chooses the criteria as time, cost and efficiency (productivity) to evaluate the performance. *Yilmaz and Bititci (2006)* compared the performance measurement of manufacturing and tourism industries from a value chain perspective. Here the authors demonstrated the usability of SCOR-like frameworks in the tourism industry to manage and measure the value chain processes.

The search by *Cagnazzo et al. (2010)* focusses on the role of performance measurement systems as a critical success factor to support quality improvement initiative in supply chain. That search was also valuable in proving the correlation between performance measurement systems and quality improvement initiative/s. *Cuthbertson and Piotrowicz (2011)* presented a performance evaluation framework in various supply-chain contexts. The developed framework, presented with a case study, is suitable to compare various systems used across different supply chains.

*Vaidya and Hudnurkar (2013)* aimed to evaluate the performance of supply chain using multiple criteria approach. A multi-criteria decision making (MCDM)

tool, like analytic hierarchy process is used to develop an eight step methodology for performance evaluation. The researchers proposed methodology is also elucidated with an illustration and a case from Indian chemical company. Supply chain performance number is computed, suggesting the present performance status of the supply chain. The methodology also helps rank the various links according to its performance. The analysis leads in computation of supply chain performance number (SCPN): the value lies between 0 and 1. That search also presents a unique approach for supply chain performance evaluation considering multiple criteria, with a flexibility to modify and analyze using the available data sets.

*Della Bruna Jr et al. (2014)* develop a performance evaluation model for the operations of the supply chain of an organization of the refrigeration equipment sector. The tool must aid the decision maker in the performance improvement and creation of competitive advantages. That study adopted a mixture of qualitative and quantitative approaches and applied them through a case study. The data collection was conducted through unstructured interviews and supplemented by documentary research. The applied intervention instrument is the Multi-criteria Decision Aid – Constructivist (MCDA-C). In addition, the researchers also highlighted the current situation diagnosis and elaboration of improvement actions related to lean philosophy and advanced planning systems.

After scanning that scope of search it's obvious that the performance criteria need to be classified based on various criteria (for instance, cost, customer service, etc.) rather than on the basis of phases of supply chain (for instance, plan, source, make and deliver). This classification as multi criteria decision making (MCDM) enable the performance measurement effective as per business strategy. The importance of criteria may vary for each element. Further, with the

motive to improve the overall efficiency of the supply chain, internal and external performance metrics needs to be monitored. This integrated performance matrix can also be useful to facilitate monitoring of actual performance and responses (Lambert and Pohlen, 2001).

### 3. The performance Evaluation criteria

To utilize the supply chain at its maximum performance level, organizations have to integrate its goals and activities (Cooper *et al.*, 1997) and all its stakeholders. The performance evaluation of a supply chain is necessary as it helps in motivating employee or/and providing feedback to focus on weak areas, and measuring the degree to which the firm has attained its strategic goals. Briefly, the different elements/links comprising a supply chain (and hence the supply chain) needs to be evaluated for its performance so as to enable the manager to effectively monitor and control the process/es. Through the survey of literature, we found more than 80 criteria. These criteria have been classified under many aspects as financial or nonfinancial; it could be tangible or intangible and classified also into strategic, tactical and operational criteria. The criteria for supply-chain performance evaluation can either be quantitative or qualitative.

Specifically, in case of supply-chain performance evaluation, the decision maker has to consider a certain number of criteria according to organization vision and strategic goals. Our proposed framework deal with the performance evaluation of any supply chain as a multi-criteria decision making (MCDM) problem. This aspect directed our search to select the performance evaluation indicators accordance to our scope and

supply chain basic nature, activities, and practices. The selected evaluation criteria depend upon two main indicators. Supply chain performance framework indicators:

#### 3.1. Performance Driver Oriented Indicators

It is the *leading indicator* which represents the performance driver oriented measures. These indicators measure the efficiency of different supply chain practices taking into consideration the process stakeholders (supplier and employee). Performance driver oriented indicator measured by evaluating mainly four sub performance indicators: supplier, production, inventory, and employee & learning growth performance indicator. These leading indicators very critical as it help organization management to communicate and translate business strategies into action. All that will be monitored and assessed with the cooperation of process stakeholders (employees and suppliers).

#### 3.2. Outcome Based Measure Indicator

The second indicator is the *lagging indicators* which represent the outcome based measures. These indicators monitor and measure the effectiveness of the applied strategies and show the real results and value of organization performance to the environmental stakeholders (customer, owners, and community). Outcome based measures indicator will be evaluated through two sub performance measures: customer relationship and financial performance indicator. All the selected performance criteria, indicators and sub-indicators displayed as following in Table 3.1. These indicators will be discuss in the following sections and summarized in table 1.

*Table3.1.The proposed organization performance evaluation criteria.*

Main performance Criteria	Main performance Measure criteria	Sub-performance Criteria Indicators	Sub-sub performance Metrics	
<i>1.Performance Driver Oriented Indicator</i>	1.Supplier Performance	1.1. Supplier Lead time.		
		1.2. Technical competence.		
		1.3.Supplier cost saving initiatives		
		1.4.Delivery reliability		
		1.5.Supplier agility		
	2.Production Performance	2.1.The productivity	2.1.1.Incoming material quality	2.1.1.Incoming material quality 2.1.2.Units shipped per employee 2.1.3.Rejects during manufacturing 2.1.4.Effectiveness of master Production schedule. 2.1.5. Effectiveness of distribution Planning schedule.
			2.1.2.Units shipped per employee	
			2.1.3.Rejects during manufacturing	
			2.1.4.Effectiveness of master Production schedule.	
			2.1.5. Effectiveness of distribution Planning schedule.	
		2.2.Range of product and services		
		2.3.Capacity utilization		
	2.4. Order cycle time.			
	2.5. Effectiveness of scheduling techniques.			
	2.6. Total supply-chain cycle time.			
	2.7.Flexibility/adaptability	7.1 Volume flexibility 7.2.Mix flexibility 7.3Product customization 7.4.Organization structure 7.5.Response time		
	3.Inventory Performance		3.1.Inventory turn	
			3.2.Inventory level	
			3.3.Absolute inventory	
3.4.Quality of storage				
3.5.Warehouse cost				
3.6.Warehouse Utilization				
4.Employee & learning growth performance		4.1.Product development cycle time		
		4.2.Employee satisfaction Level		
		4.3.Employee absenteeism Index		
		4.4 Percentage of employees Trained		
		4.5.Employee retention index		
<i>2.Outcome Based Measures Indicator</i>	1.Customer relationship Evaluation	1.1.customer satisfaction Index		
		1.2.Customer's feedback /complaints		
		1.3.Order fill rate		
		1.4.On time delivery		
	2.Financial performance		2.1.Total cost	
			2.2.Total cash flow time	
			2.3.Financial productivity	
			2.2.Cost as a percentage of sales	
2.3.ROI				
2.4.Net profit rate				

### 3.1. Performance Driver Oriented Indicator.

It is the leading indicators which represent the performance driver oriented measures. This indicator measures the efficiency of different supply chain practices taking into consideration the process stakeholders (supplier and employee). Performance driver oriented indicator measured by evaluating mainly four sub performance indicators: supplier, production, inventory, and employee & learning growth performance indicator. This leading indicator very critical as it help organization management to communicate and translate business strategies into action. All that will be monitored and assessed with the cooperation of process stakeholders (employees and suppliers). Sub performance indicators are briefly discussed as follow;

#### 3.1.1. Supplier performance indicator

Traditionally supplier performance measures were based on price variation rejects on receipt and on time delivery. For many years, the selection of suppliers and product choice were mainly based on price competition with less attention afforded to other criteria like quality, reliability, etc. More recently, the whole approach to evaluating suppliers has undergone drastic change.

In recent years, to achieve the high levels of product demanded by customers, the ability to link and work effectively and efficiently with suppliers has become the focus of SCM. In a supply chain management, the performance of potential suppliers is evaluated against multiple criteria important at the strategic (S), operational (O) and tactical (T) level and from the view point of being one of organization process stakeholder (e.g. *Kim & Ellegaard, 2011; Lee, Chang, & Lin, 2009; Ordoobadi & Wang, 2011*). The elected supplier evaluation criteria are:

**Supplier lead time:** this is the time required by the supplier to supply the material or product or assembly. (S)

**Technical competence:** this is the technical ability or skills of the supplier to provide materials or assemblies or products as per the specification and volume. (S)

**Supplier cost saving initiatives:** this is interest shown or initiative taken by the supplier to reduce cost across the chain. (T)

**Delivery reliability:** it is the ability of the supplier to deliver material or goods as scheduled or committed. Here consistency of the supplier is considered. (T)

**Supplier agility:** supplier ability to respond to quality and related problems. (T)

#### 3.1.2. Production performance indicator

This is basically important evaluation measure of the supply chain because the activity carried out by organizations that own production sites, and their performance has a major impact on product cost, quality, speed of delivery and delivery reliability, and flexibility (*Mapes et al., 1997; Slack et al., 1995*). As it is quite an important part of the supply chain, production performance needs to be measured and continuously improved. Suitable metrics for the production level are as follows:

**The productivity:** it reflects the efficiency and the effectiveness of the products manufactured and transported to the required destination. The productivity measures are:

- **Incoming material quality:** rectifies the quality of the raw material/product that is to be processed or supplier defect free deliveries. (S)
- **Units shipped per employee:** this value is the ratio of the task completed to the task allotted by an employee in the link. (S)
- **Rejects during manufacturing:** these are rejects noted by the supervisor in the link under consideration before supplying to the customer. (O)

- *Effectiveness of master production schedule*: scheduling refers to the time or date at which activities are to be undertaken. Such fixing determines the manner in which the resources flow through an operating system. (T)
- *Effectiveness of distribution planning schedule*: this criterion indicates the effectiveness of planning schedule of the distribution of the products in comparison to the actual. Briefly, this criterion can indicate the effectiveness of planning in real implementation. (T)

**Range of product and services**: According to *Mapes et al. (1997)*, a plant that manufactures a broad product range is likely to introduce new products more slowly than plants with a narrow product range. Plants that can manufacture a wide range of products are likely to perform less well in the areas of value added per employee, speed and delivery reliability. This clearly suggests that product range affects supply chain performance. (S)

**Capacity utilization**: capacity utilization directly affects the speed of response to customer demand through its impact on flexibility, lead time and deliverability. This criterion evaluates the percentage utilization of the machine. According to *Slack et al.*, capacity utilization directly affects the speed of response to customers' demand. Hence, by measuring capacity, gains in flexibility, lead time and deliverability will be achieved. (O)

**Order cycle time**: the time required to deliver a finished product from the time order was received (*Bower and Hout, 1988; Christopher, 1992*). Time elapsed in receipt of order to delivery of finished goods to customer. It is very important measure which influences customer service. It acts as a control point to customer service and also as a feedback to control operations.

Total order cycle time=order entry time (through forecasts/direct order from the customer)order planning time (design communication scheduling time)order

sourcing, assembly and follow up timefinished goods delivery time. (S)

**Effectiveness of scheduling techniques**: Scheduling refers to the time or date at which activities are to be undertaken. Such fixing determines the manner in which the resources flow through an operating system. The effectiveness of this has a significant impact on the performance of supply chain (*Gunasekaran et al., 2001*).For example, scheduling based on JIT has tremendous influence on inventory levels. Similarly, computer generated schedules based on systems like MRP, and more recently ERP, provide a detailed and accurate bill of materials. These impact the effectiveness of purchasing, throughput time and batch size. (S)

**Total supply-chain cycle time**: this indicates order lead time plus time wasted in supply-chain channels. (S)

**Flexibility/adaptability**: Continuous adaptability/flexibility is defined as the supply chain's ability to modify the particular aspects of management processes, information exchange and organizational structures (*Brennan et al., 2003; Lee, 2004; Jin and Hong, 2007*). The criteria under this category are:

- *Volume flexibility*: ability of the supply chain to respond quickly as the volume of demand increases or decreases as per market conditions. (S)
- *Mix flexibility*: making or swapping of product capacity. (S)
- *Product customization*: flexibility of the services to meet customer changing needs. (S)
- *Organization structure*: it is ability of the organizations or the chain to adopt structural changes like plant co-location, implementation of IT solutions, operational philosophies, etc. for improving overall efficiency of the chain or reduce cost or to be more responsive to customer needs. (S)
- *Response time*: the time to respond to the changes in the market. (S)

### 3.1.3. Inventory performance indicator

This indicator is critical as much as it measure how supply chain performance is healthy. Also measure the efficiency of supply chain strategies. Inventory performance criteria have direct impact to organization financial performance.

In a supply chain, inventories range from raw materials, subassemblies and assemblies to finished products, as well as inventories held up in transit. What was traditionally perceived as a buffer in production to cope with uncertainties actually emerged to be one of the reasons for the increase in lead-time (*Slack et al., 1995*). As customer service requirements constantly increase, effective management of inventory in a supply chain becomes increasingly critical and important. Hence, it is essential that costs associated with inventory should be evaluated, and proper trade-offs, with suitable performance measures, and the elected measures are:

**Inventory turn:** this criterion gives a fair idea of the inventory turnover with respect to the previous year (month or week) in the link. (S) (T)

**Inventory level:** the desired stock in hand. (S)

**Absolute inventory:** the minimum inventory required so that the supply flow is not interrupted. (S)

**Quality of storage:** this criterion indicates the level at which the quality or standard norms in which the raw material or finished goods are to be stored are followed. (O)

**Warehouse cost:** the costs incurred due to stacking (storing) of the components are classified in this category. (O)

**Warehouse Utilization:** this criterion related to all activities of warehousing Processes during a certain time. It refers to storage location that is occupied compared with full capacity. It is measured by location occupied/Total number of location in warehouse.

### 3.1.4. Employee & learning growth performance indicator

This criterion a company's ability to innovate, improve and learn lies directly to company's value. Innovation and continuous learning process can bring about efficiency in operating domain of the business. Moreover, it ensures cost reduction and product differentiation to meet the varied requirements of the customers. As a result, it strengthens the financial ability. Also it mainly aim to evaluate the ability to achieve organization vision, by sustaining innovation and change capabilities, through continuous improvement and preparation for future challenges. Also, it evaluate satisfaction level of organization employee as they represents a very powerful organization supply chain processtakeholder. This performance measure has direct relation to all performance measures and strategic goals achievement.

**Product development cycle time:** it is time required to the complete process of bringing a new product to market Bower and Hout (1988). (S)

**Employee satisfaction level:** it is the measure of satisfaction of the work force about their work environment and refer to how they really involved in business as process stakeholders. It is estimated by an employee satisfaction survey and calculated as weighted sum of employee judgments on detailed satisfaction dimensions. (S)

**Employee absenteeism Index:** it is measure of employees' absence from work as it reflect the attraction of work environment and commitment of workforce toward organization targets. It is estimated as percentage of total days of absence to the total number of working days for all staff. (S)

**Percentage of employee Trained:** this measure refers to the quality of the work force and estimates their skill development during time and ensures their effectiveness. It is estimated by the percentage of employee participated in at least one



training program during the examined year. (S)

**Employee retention index:** it measure the turn over employees' rate as it reflect the loyalty of the process stakeholder and the stability of work environment performance. It is estimated by the percentage of employees continuing to work compared to the previous evaluation period. (S)

### 3.2. Outcome Based Measures Indicator

The second indicator is the lagging indicator which represents the outcome based measures. This indicator monitors and measure the effectiveness of the applied strategies and show the real results and value of organization performance to the environmental stakeholders (customer, owners, and community). Outcome based measures indicator will be evaluated through two sub performance measures: customer relationship and financial performance indicator. Those sub indicators are briefly discussed as follow;

#### 3.2.1. Customer relationship performance indicator

This criterion refers to "How do customers see the business". So, supply chain performance evaluation demands that the management must translate their general mission statement on customer service into specific measures that reflect the factors that really matter to the customers? Without a contented customer, the supply chain strategy cannot be deemed effective. *Lee and Billington (1992)* and *van Hoek et al. (2001)* emphasized that to assess supply chain performance, supply chain metrics must concentrate on customer satisfaction. Customers generally, concern to lead-time, quality of products and services, company's performance service and the cost effectiveness. But on long term basis and more importantly in the era of globalization any firm's competitiveness lies on different customer related factors are:

**Customer satisfaction Index:** it measures the satisfaction of customer to products and services. It is estimated by survey and calculated as weighted sum of customer judgments on detailed dimensions. (S)

**Customers feedback/complaints:** the feedback or/and the complaints about the conformance or the non-conformance of the product or customer perceived value of the product. (S)

**Order fill rate:** the ratio of the orders fulfilled and the order received is the order fill rate at the given time. (T)

**On time delivery:** number of times the product has reached the customer on the specified time. (S) (O)

#### 3.2.2. Financial performance indicator

This criterion refers mainly to stakeholder view of success which directed to succeed financially, by delivering value to our shareholders. Supply chain assets include accounts receivable, plant, property and equipment, and inventories. With increasing inflation and decreased liquidity, pressure is on firms to improve the productivity of capital to make the assets sweat. In this regard it is essential to determine how the cost associated with each asset, combined with its turnover, affects total cash flow time. Many indicators are used to assess the financial performance of supply chain, such as assets cost, return on investment, and total inventory cost.

The elected indicators for our framework are:

**Total cost:** it refer to the summation of inbound freight cost, outbound freight cost, warehouse cost, third party storage cost, order processing cost, direct labor cost, administrative cost, and service cost. (S) (T)

**Total cash flow time:** It is very important measure as it determines how the costs associated with each asset, combined with its turnover. It can be measured as the average days required to transform the cash invested in assets into the cash collected from customer (*Stewart, 1995*). (S)

**Financial productivity:** this measure estimated by determining the ratio of inputs (total investment such salary, overheads, utility, etc.) and outputs (total revenue such sales income). (S)

**Cost as a percentage of sales:** this performance measure reflects the cost with the consideration of the sales to the last customer in the link. (S)

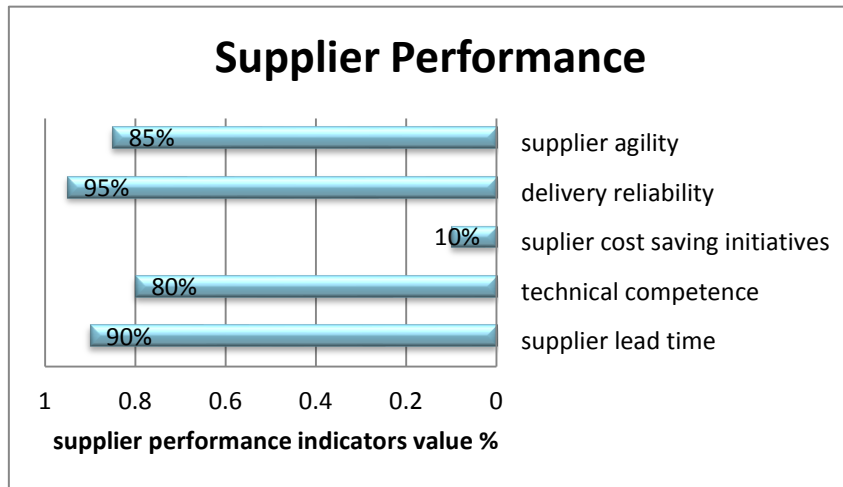
**Return on investments (ROI):** the monetary benefits expected/achieved with respect to the investments. It is more accurate reflection of a company's ability to generate shareholder value is increasingly being mirrored on the corporate side by executives looking for ways to evaluate the performance of business units. It measures the real cash return on the capital invested in a company as a percentage. It is estimated by dividing operating profit (net income)/ operating capital (total capital). (S).

#### 4. Case Study

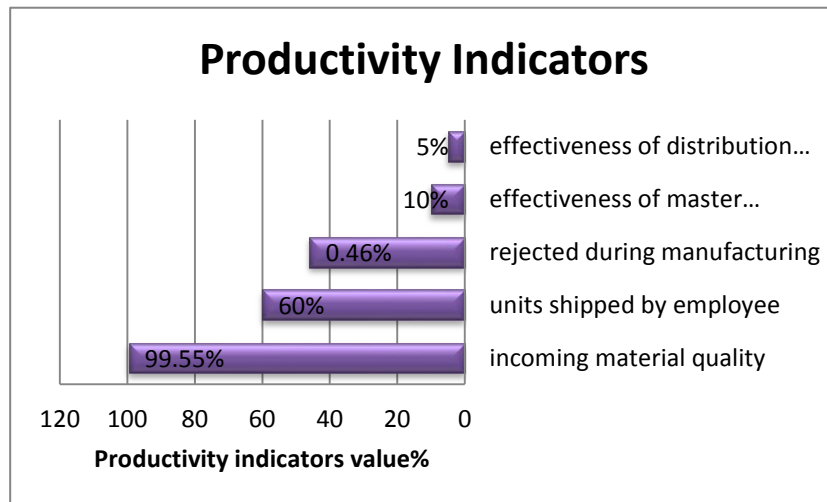
The organization M has been established in 1979 as a small family business for importing automotive components specialized in air conditioners. Currently, Organization M is a shareholding company, with 250 employees developing & manufacturing high standard automotive air conditioners and refrigeration solutions with annual turnover of 150m EGP in 2013. Its products are produced and sold in different models. Despite its growing leadership position, there is a growing demand in the market for better service and greater product quality. In addition, new competitors (mainly from Asian countries) have been

offering increasingly competitive products and prices to customers. As a result of all those challenges, the organization management changed their direction to face the growing needs. The organization management directed their effort to apply the modern management through applying one of the quality management systems. All those issues will be set in a strategic plane, which empower the cooperation between our proposed framework implementation and the organization M. In addition to staying at the cutting edge of product innovation and diversification, the company also faces the challenge of increasing the competitiveness of its supply chain operations. To meet those challenges, the company was seeking to ensure having a performance evaluation model that enable organization management to assess their actual performance. With this crucial step, the organization management could direct their effort to improve organization performance. At the same time, it needs to achieve the strategic objectives pursue the efficient use of its productive resources and deliver excellent financial results for its shareholders.

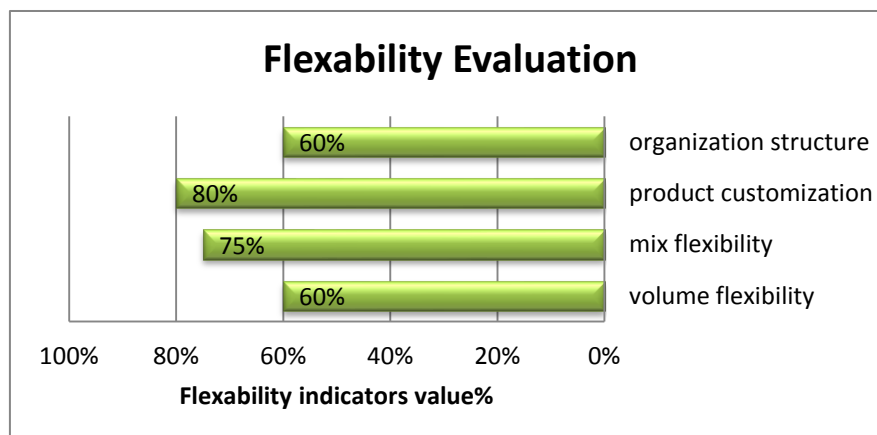
This step assesses the organization performance according to our proposed supply chain performance evaluation framework. To assure the perfect understanding of this stage to the whole organization departments, we arrange a workshop. Through this workshop, the researcher defines the strategic objectives of organization M and linked them to the proposed SC PE framework.



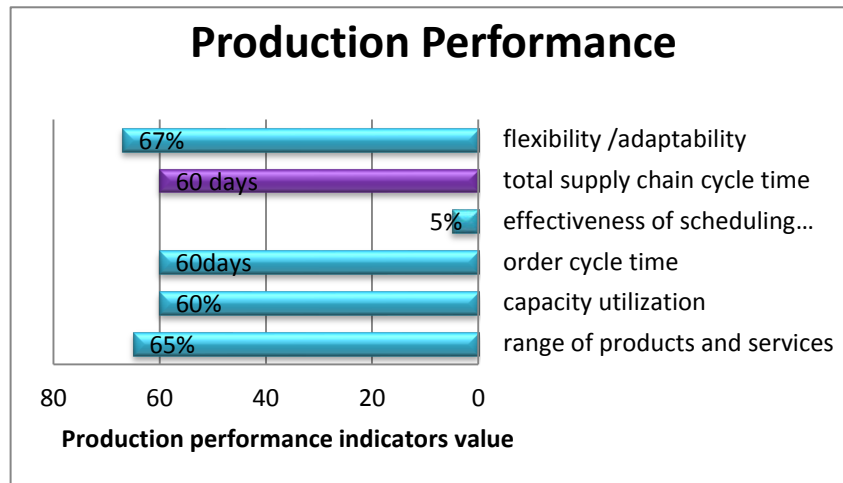
*Fig.1. The results of supplier performance assessment of Organization M*



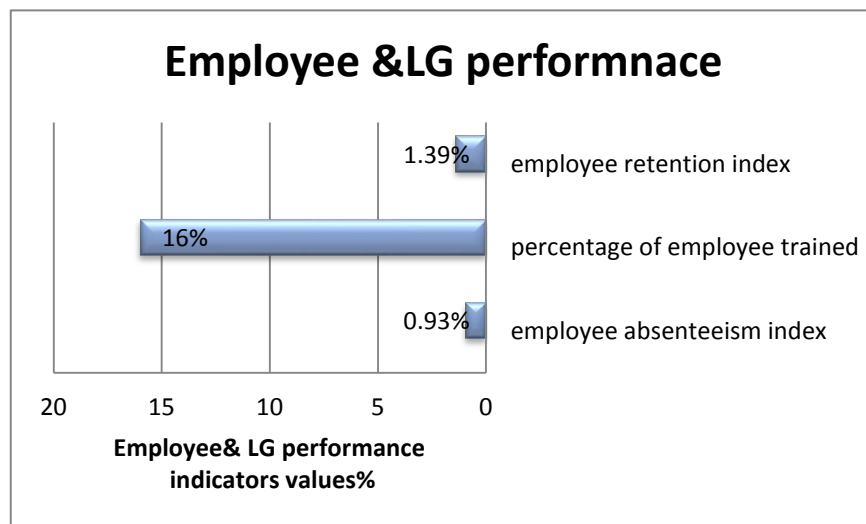
*Fig.2. The results of productivity assessment of Organization M*



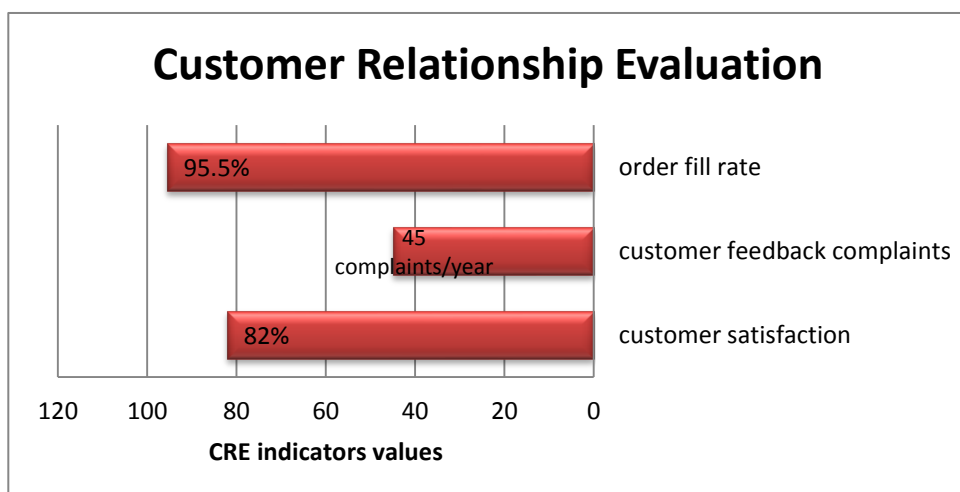
*Fig.3. The results Flexibility assessment of Organization*



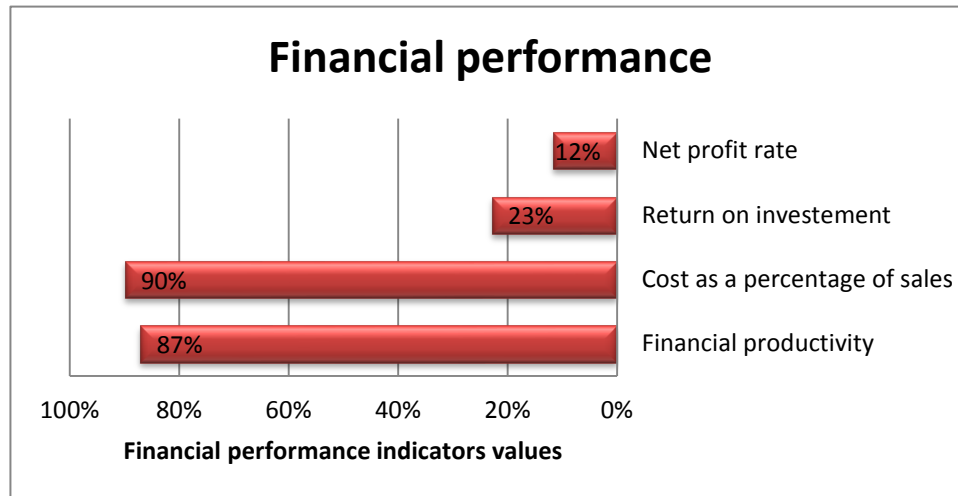
**Fig.4.**The results of Production performance assessment of Organization M



**Fig.5.**The results of Employee & LG performance assessment of Organization



**Fig.6.**The results customer relationship assessment of Organization M



*Fig.7. The results of financial performance assessment of Organization M*

#### **4.1. The Analysis of the Current performance of organization M**

Through the assessing the organization performance by using our proposed SCPE, there are a huge facts extracted from those key performance indicators (KPIs) scores reflecting the existing organization state. These concluding remarks support the validation of our proposed framework. Also guide the management to the required improvement initiatives to achieve their strategic objectives. The remarks will be presented here in the same order in the proposed SCPE framework in Table.1.

##### ***Supplier Performance:***

According to the assessment key performance indicators (KPIs) as in Fig.1, the supplier performance is very good related to the quality and delivery commitment attitude. But they still need to improve saving ratio initiatives through developing suppliers profile evaluation. Because that, the suppliers have been reported as one of the critical success factors of Lean Six Sigma (LSS) approach.

##### ***Production performance:***

We found this area very hotspot area including many indications to a real

problems affect organization performance effectiveness and efficiency. Production performance has been displayed through three Fig.2, Fig.3, and Fig.4. Fig.2 and 3 represented sub indicators of production performance indicators related to productivity and flexibility measures.

As in Fig.2, Beginning with quality of products is 99.55% at all manufacturing process which provides acceptable level of quality as it is the prerequisite for any manufacturing and customer. In Fig .4, there is inefficient use of machine and labor capacity through organization. It is found that there are huge amount of not value added (NVA) activities and waste documented in the current value stream mapping (VSM). The score of productivity confirm our diagnosis. We expect that the flexibility score and the effectiveness of scheduling techniques will be very low and the assessment score prove that diagnosis and expectations.

Production area examined through the supplier input process output customer (SIPOC) and the responsibility of scheduling techniques turned to be the main task of production planning department. As a result there was investigation about the applied scheduling

techniques, and we found there is a real need to improve the production planning skills of department staff through improvement programs.

***Inventory and warehouse Performance:***

These assessment indicators have a direct relation to lean practices as it reflects the existence of various waste types. It also refers to the causes of them which related to different responsible area cross the organization supply chain. The inventory turn was 110% which indicate excess material inventory and could be modified as the planning department reconsider their calculations. It also refers to the efficiency of maintenance plan to avoid machine downtime. The warehouse utilization was 30% of the existing area which is very low and we must put this wasted asset in scope of improvement initiatives.

***Employee and LG performance:***

Employees who are motivated and empowered are the key element in LSS approach. LSS regard people as assets as they are the real engine of success, change, creation, and continuous improvement.

In assessing the employee performance as in Fig.5, we found a very good commitment to organization M appeared through the absenteeism index and Employee Retention index. But, to assure the spiritual level and motivation status of organization work force, the employee satisfaction index has no records. And this is highly important risk as it reflects the bad communication between the organization management and their people. In other side of evaluation, the assessment directed to skill level of work force. The percentage of trained employee was very low. This due to a different NVA activates, slow response to any change, and also low productivity.

So to have healthy successful organization you should communicate with their people to make them in motivated, well educated, satisfied zone as it has a direct relation to the organization performance effectiveness. There would be

another hot spot of improvement initiatives.

***Customer Relationship Evaluation:***

With these performance key indicators, we get a real reflection of organization performance in the outside business world and market. In Fig.6. It reflects the customer loyalty to our organization which will be translated to financial gains to organization stakeholder. So, it is essential to set up good relationships with customers to understand their need and predict their demand to match between them and production flow. The external customer evaluation indicated a good response about the products quality level also growing trust in organization commitment and accountability. But still have chances to more improvements.

***Financial Performance:***

It is the results of all previous performance. If the organization performance was effective and efficient, the financial gains will be up and the stakeholders will be satisfied. The current financial performance of the organization M as in Fig.7.need to be improved as it refers to low financial productivity %87 and very low ROI %23. Also pinpoint out that the total cost as percentage of sales is %90 and it means that the total cost through Organization M is very high due to a lot of "Muda" and NVA activities.

A lot of interest should be played to these indicators, but the real fact all these financial indicators are symptoms to a real problems related to organization SC activities. If we concentrated on improving all SC departments' activities through LSS projects, all financial indicators will be improved at once. After analyzing the current organization M's performance and set the base line for directing the improvement effort to achieve their strategic goals.

***The improvement initiatives list:***

***Improvement Initiative #1:*** it is the improvement project raised through supplier performance assessment. This will be "Cost reduction by improving efficiency

of sourcing most effective suppliers" project.

**Improvement Initiative #2:** production performance assessment includes many NVA activities and different type of waste. So, there will be need for "Cost reduction by improving efficiency of processes" project.

**Improvement Initiative #3:** warehouse utilization need to be improved as it affect the production performance. So this will be "improving warehouse Utilization" project.

**Improvement Initiative #4:** the work force motivation, skills, and culture change are the engine power of any operational excellence and organization success. As a result of Employee performance there is a bad need for "human resource management programs" project.

**Improvement Initiative #5:** to achieve the strategic objectives of organization M related to customer relationship, they should implement "Revenue improvement by servicing more customers" project.

**Improvement Initiative #6:** the financial performance of organization was unsatisfied and need to be improved. So, they need "Working capital reduction by improving cash management and fast delivery" project.

## 5. Conclusion

After the implementation of the proposed framework, the selected criteria proved that they are efficient and reflect all supply chain activities including suppliers. That's give the organization management real assessment of the supply chain activities efficiency and effectiveness. So, the organization top management must integrate this step with the performance improvement through the implementation of quality management system as Lean Six Sigma. Finally, the aims of the proposed framework have been tested through the case study and prove that the proposed framework is valid, valuable and sustainable framework.

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