Supply Chain Management– Productivity and Profitability Measurement– A Case of M/S Devi Galvanizers

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Abstract: Supply Chain Management (SCM) is primarily concerned with the efficient integration of suppliers, factories, warehouses and stores so that merchandise is produced and distributed in the right quantities, to the right locations and at the right time, and so as to minimize total system cost subject to satisfying service requirements.(Simchi-Levi). SCM is important in the context of manufacturing process and the quality and productivity are the two major concerns in the globalised competitive market. Due to lack of coordination and integration in a supply chain network, there are balancing problems between supply and demand which results in an increase in cost, excess inventory, wastage etc. The objective of the study is to measure the profitability and productivity of the supply chain and to suggest improvement techniques for the case industry in the inventory management, plant layout, rearranging work schedules, improvement of logistics .A systematic review of the literature related to supply chain Management performance measurement was conducted and analyzed the performance measurement parameters like profitability and the productivity of the company .The company selected is M/s DEVI GALVANIZERS, producers of chicken mesh, wire mesh etc. situated at Kalarcode, Alleppey District. The key performance measurement elements selected for the case company are profitability, productivity and the lead time. The data collected from the company is analyzed and performance of the company is assessed.

Keywords: Lead Time, Productivity, Profitability ,Supply Chain Management, Supply chain performance measurement

I. INTRODUCTION

A supply chain is a set of integrated processes, by which raw materials are manufactured into final products and delivered to customers, through warehousing, distribution activities, retailing, and so on (Cooper et al., 1997). A typical supply chain contains several echelons, and each echelon can include numerous facilities, resulting in complex structures. The complexity of the supply chains arises, in particular, from the number of echelons in the number of facilities per echelon [1]. Indeed, modern supply chains encompass owned or contract manufacturing and transportation facilities, suppliers, distributors, and customer service centres scattered over the globe (Bottani and Montanari, 2011).

Due to the increasing complexity of supply chains, currently there is the need for measuring and monitoring the performance of those systems, to derive useful insights for supply chain optimisation. The issue of evaluating supply chain performance is well debated in literature. Researchers, in particular, point out that measuring the performance of supply chains is a complex task, due to the fact that supply chains includes several actors that cooperate to achieve both logistic and strategic objectives. Nonetheless, performance measurement of the entire supply chain is essential when managing and developing the supply chain itself, and becomes particularly important in those contexts where supply chains are considered a key factor of corporate success (Waters and Waters, 2007; Olugu et al., 2011). Moreover, performance measurement is crucial for supply chain management, i.e. the process of managing the processes of planning, coordinating and controlling the movement of materials, parts and products across the supply chain, from the suppliers to the final customer (Simchi-Levi et al., 2008).

Additional SC performance metrics can measure the level of customer satisfaction, that is recognised as the ultimate evaluation of the value generated by the SC (Estampe et al., 2013). By reviewing the literature on SC performance measurement, [2] Gunasekaran et al. (2004) develop a framework that includes numerous metrics and measures, related to the following SC processes: (1) plan, (2) source, (3) make/assemble, and (4) delivery/customer. Moreover, depending on the specific research carried out, different or additional SC performance measures could be considered and applied (Beamon, 1999) [3].

In line with the above, a systematic review of the literature related to supply chain Management was done and supply chain performance measurement parameters like profitability and the productivity of the company M/s Devi Galvanisers was analyzed.

II. DESCRIPTION OF THE COMPANY

The company M/s Devi Galvanizers is located at Vadakkal in Alleppey District . The lay out details , product details m personnel employed , area of the facilities as detailed in Table (1) below:

Table 1.1 - Company's profile

Name of the company	Owner's name	Product	Area (in cents)	permanent	Daily wage workers
Devi galvanizer	R Sundar	GI wire	40	20	10
Vishnu steels	Saroja Sundar	B inding wire	30	7	10
Raj industries	Vishnu Sundar	HB wire	25	5	5
Krishna wires	Vipin Sundar	HB wire	20	3.	5
Vibhu Metals	R Sundar	Sales Department			

A. Raw materials

The raw materials are purchased from RASHTRIYA ISPAT NIGAM LTD , Raipur, Chattisghat which is certified under ISO 14001 having an ISO document number QMS-R/MKT-07 and Aluva Visak Steel Yard, Kalamasery . The products available are G.I wire, coating wire, binding wire, weld mesh Barbed wire, chain link and so on. It has been estimated that the company has approximately 600 tonnes of production per month. The different types of products available are shown in Table 1.2 given below. Insulated GI wire of thickness 2mm is one of the important products with high demand. The finished GI wire is coated with an insulating material which is a combination of PP,LD and a suitable colour (green, black or gray.) These are in the form of small granules. So there is an initial mixing of granules (PP,LD and color) in a mixer. This mixture is supplied to a chamber and heating is done by using a heater. The heater is set at a temperature of 180degree Celsius and it gets melted .There are four heaters arranged in series. The first three heaters are applied with a voltage of 500V and the last one is applied with a voltage of 1000V.The GI wire to be insulated is wound in a boban which is passed through the heater and drawn by using a motor running at 36 rpm. The melted granules become a paste and it gets coated on GI wire which is then passed through a chamber containing water. It is for the proper cooling of the insulated wire and their by proper coating of wire is ensured .The good quality insulating GI wire having good surface finish and smooth. If the insulating material is rough, it indicates that cooling or heating is not done in a proper way. This insulation is completely waste. So it is removed and insulation is done again .It is one of uneconomical losses in the unit. Daily one tonne of insulated GI wire is produced in Devi Steel and Galvanized industries. For this 120 kg of mixing is required. The granule proportion is like that for 10kg of PP,1kg of LD and 300gm of color is required .According to the customers requirement Devi steel industries produce various colors of insulated wire. The company purchases raw material ie 200 tonnes of binding wire from Visakhapatttanam with thickness ranging from 5.5 mm to 12 mm. The machining is done on a wire drawing machine where a die is used to reduce the diameter of the wire. The die is placed inside a die box. Inside the die box, a powder made up of animal fat is present. At a time one die box can reduce 0.5 mm to 0.8 mm. For bottling purpose 5 mm – 10 mm is used. At the beginning the size of the binding wire is reduced to 4.5 mm. Then this 4.5 mm wire is placed inside a furnace and annealing takes place at a temperature of 400^0C for 4:30 hours. .A de-scale is used to remove the scale and the diameter is reduced to 2.7 mm which is again subjected to annealing inside a furnace at a temperature of 850^0C for 3 hours before finally becoming soft .

Table 1.2: Details of Product Availability

Item	Tonnes
GI wire	150
Barbed wire	200
Hard Black wire	200
Annealed wire	50

B. Objective of the Study

To maximize the overall profit generated is the goal of every commercial supply chain , however in the tough competitive market of today more importance is given to customer satisfaction ie from more than a quality product a company must get the product to its customer at the required place at the required time. The objectives of our study:
➤ To understand the functioning of the supply chain of the company
➤ To understand the dynamics of the Supply chain of the company
➤ To identify the key players in the supply chain

> ➢ To suggest productivity improvement techniques for the industry by analyzing the supply chain either by any or all of the parameters
>   - Modification of plant lay out
>   - Improving logistics
>   - Inventory management
>   - Rearranging work schedule etc

C. Methodology of the study

Supply chain management covers the entire product cycle, from the introduction of raw materials to the consumer purchasing the product. It is a comprehensive arrangement that can span from raw material sourcing to end —consumer purchase. A company should implement supply chain management for achieving short and long term goals like profit, market share, and customer satisfaction. Asystematic review of the literature related to supply chain Management performance measurement was conducted and analyzed the performance measurement parameters like profitability and the productivity of the company. A questionnaire was prepared and based on this data was collected

D. Supply chain in Devi Galvanizers

The company distributes the products in 9 districts in the southern and central of Kerala. Around 50 whole dealers are the main customers . The raw materials are purchased from RASHTRIYA ISPAT NIGAM LTD , Raipur, Chattisghat which is certified under ISO 14001 having an ISO document number QMS-R/MKT-07 and Aluva Visak Steel Yard, Kalammasery. The HB wire is SAE 1008-1012 . The Purchase department analyses the order from customers and purchase the required raw materials as and when necessary which followed by the Research & Development department where things like design, model demand, development and so forth are thoroughly studied. After receiving approval from the customers, Quality control department ensures that the purchased materials are flawless and the required standards are met. Mass production and manufacturing is commenced and the finished products are sent to the inventory. Material Handling is done mainly by means of cranes, hoists and industrial trucks. Transportation is managed by the company itself on a contract basic to make sure of immediate delivery to the customers.

E. Modification of Plant Layout

Productivity of the company in terms of Storage Space Utilization is calculated.
Storage space utilization= total storage space in use / total storage space available *100.
The total storage space available is 2000 Sq ft and the entire spaceis utilized for storage.
Hence Total storage space availability = (2000/2000)*100 =100%
Inventory of 300 tons is stored for 20 days. Hence **inventory turnover rate** comes to 18 (365days /20 days) annually .High inventory turnover rate shows that the profit is increasing . Modification of layout is not possible at this condition.

F. Sale turnover and operating profit rate of Devi Galvanizers

The financial data of the company for the years 2011 to 2016 was analyzed.The sales turn over shows a gradual increase over the years.
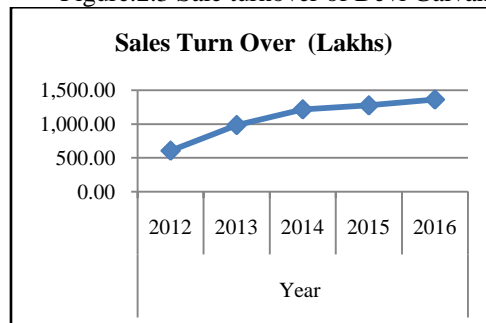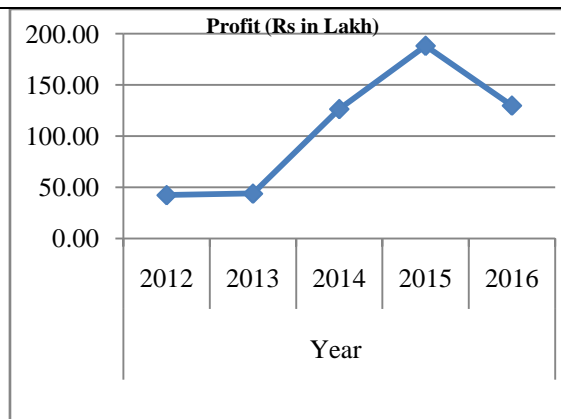
Figure.2.3 Sale turnover of Devi Galvanizers

Figure.3.5 operating profit rate of Devi Galvanizers

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The operating profit shows a gradual increase in the 2013 and shooted in 2014 and 2015.Even though the sales turnover has increased , the profit rate is found to be decreasing in the year 2015-16.

The following 3 scenario has been worked out and is shown as below.

Table 3.1 Comparative table for fixing SCM targets

Description of Items	Scenario 1 2017	Scenario 2 2017	Scenario 3 2017
ACTUAL PRODUCTION of GI Wire IN TONNES (PER MONTH)	150	180	180
VALUE OF GI wire SOLD (PER TONNE)	908456	908456	908456
Total Sales Cost of GI wire (A)	**136,268,438**	**163,522,125**	**163,522,125**
Raw materials consumed at cost price	44,088,625	40,080,568	44,088,624.64
Consumable materials at cost price	2,216,268	2,014,789	2,216,268
Rent	1,014,724	922,477	1,014,724
External work and services	881,626.9	801,479	881,626.9
Other production costs	526,857.69	478,962	526,857
Personnal cost	7,256,879	7,256,879	7,256,879
Production cost (aggregate)	71,351,827	59,459,856	71,351,827
Technical assistance cost	538,727	489,752	538,727
Manufacturing cost	**127,875,535**	111,504,761	127,875,535
Packaging cost	2,593,245	2,357,496	2,593,246
Distribution cost	2,468,109	2,243,736	2,468,109
Logistics charges	7,124,178	6,476,526	7,124,178
Total distribution cost	12,977,110	11,797,372	12,977,109.55
Total supply chain cost(b)	140,852,645	123,302,134	140,852,645
Profit margin ((a-b)/b*100	**-3.25**	**32.61**	**16.09**

Scenario 1 is by keeping the actual production quantity as same as in the year 2016 and a hike of 10% in the total supply chain cost profit rate and the profit margin shows loss . Scenario 2 is by increasing the

actual production by 30 tonnes and total supply chain cost remains the same as that of the year 2016 , the profit rate and the profit margin increases. But the possibility of supply chain cost remaining the same as the year 2015-2016 is not likely. Hence scenario 3 is worked out by giving 10% hike in the total supply chain cost and increasing the production quantity by 30 tones the profit rate and profit margin increases. The following SCM targets are fixed based on the scenario 3

Table.3.2 SCM target of the company

Description of target parameter		Units	Benchmark	Target
Main	Sub item		2015-16	2016-2017
Profit	Increase in profit	Lakhs of rupees	129	226
Sales turnover	Increase in sales turn over	Lakhs of rupees	87.45	185
Quality	Increase in quality of product. So reduction in less customer complain	Number of complaints per month	9	0.0
Cost	Reduction in production cost	% of sales	90	86
Delivery Date	Reduction in time	%	82	100

III. CONCLUSION

From the aforementioned results it is evident that by applying Supply chain management techniques, company can increase their profit, productivity, sales and reduce manufacturing cost of products . Devi galvanizers intend to compete nationally and therefore should implement supply chain management. It is vital that they must continually reach new customers and attract their existing customers. The success of SCM at this strategic level requires more integration with other enterprise systems. Since many business targets and performance indicators are established in the SCM, efficiency planning, budgeting, sales and marketing can be improved. Supply chain management remain a high priority for manufacturers as a way to improve margins and retain and increase market share

A periodic visit to vendor/supplier sites is advised. This reduces procurement risk and overhead. This involves reducing the effects of sub-standard materials on process efficiency, product quality, and exposure to product liability. A vendor-customer data interchange and process integration is required .Hence it is highly recommended to start a website for the company with e-commerce platform so as to compete with the large scale manufactures. The vendor needs information on how their raw material ran in the customer's process to make necessary improvements to their system. The web enabled data handling and reporting systems will incorporate greater quality management capabilities. The systems which affect SCM will expand integration and communication capabilities. This includes greater use of web technology for both quality data collection and reporting. Accompanying the increase in SCM quality technology, companies need to train staff to be aware of how to effectively use the increased visibility of quality information. An integration with the similar companies so as to effectively utilize the resources.

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