

Performance Evaluation of Bangladeshi Apparel and Textile Supply Chain Network, A Case Study

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A supply chain is an integrated manufacturing process wherein raw materials are converted into final products, then delivered to customers. Due to the complexity of supply chain nature, it is very difficult to measure its performance. In this study Supply Chain Operation Reference (SCOR) model has been used to measure supply chain performance of a regular ready made garments industry in Bangladesh. Four Key Performance Indicators (KPI) have been measured following the measurement of overall KPI which indicates the ultimate supply chain efficiency. The four KPI values are; Quantity and Timely Delivery 56.67, Adherence to Production Target 55.92, Quality Capability 23.98 and On-Time Shipment 85.9. Overall efficiency of the supply chain is only 61.85% which is not well enough. Only On-Time-Shipment has higher KPI value. Other individual KPI values can be enriched by improving backward linkage, labor, management and production line efficiency and also improving the quality level. However, TQM will play a vital role to improve overall KPI.

Field of Research: Supply Chain Management, Garment Industry.

1. Introduction

Bangladesh has emerged as an important supplier of quality readymade garments in the global market. The spectacular growth of garment sector in Bangladesh in recent years has dramatically changed the landscape of export composition of the country. Once heavily dependent on exports of primary products lead by Jute, the economy of Bangladesh is now experiencing almost 76% export contribution from readymade garments (RMG) (Nuruzzaman, 2005). The sector has now occupied an important place in Bangladesh national economy. Nevertheless, all is not well in this sector. It faces numerous challenges and it is now on the crossroad with the phasing out of quota system, GSP facilities and new provisions of WTO.

Increasingly Supply Chain Management (SCM) is being recognized as the management of key business processes across the network of organizations that comprise the supply chain. Measurement of supply chain performance is required to understand how successfully supply chain management has been implemented in a firm.

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Supply chain management concept originated from the recognition that the process of transforming raw materials into final products and delivering those products to customers is becoming increasingly complex. For an effective and credible management of the customer, a joint effort of the suppliers, manufacturers and distributors is required. As supply chain focuses on the processes management within and beyond organizational boundaries, thus a measure of its performance is necessary for its effective operation and control.

To compete successfully in the global free trade market, the manufacturers must be adequately equipped with the latest knowledge of scientific management in minimizing lead time and other management deficiencies. All out support is required for this sector and it needs to build up the backward linkage industry to reduce the dependence on imported raw materials and to minimize lead-time (Nuruzzaman, 2005). That is the supply chain performance should be enriched.

Supply chain performance evaluation becomes one of the biggest challenges for today's competitive companies. The best in industry and world class practices have to be identified to analyze the current practices of the company. In recent years, organizational performance measurement has received much attention from researchers and practitioners. The role of these measures in the success of an organization cannot be overstated because they affect strategic, tactical and operational planning and control. Performance measurement and metrics have an important role to play in setting objectives, benchmarking, evaluating performance, and determining future courses of actions (Gunasekaran et al, 2004, Shamshuzzaman et al, 2010).

For several years, senior executives in a broad range of industries have been rethinking how to measure the performance of their businesses. They have recognized that new strategies and competitive realities demand new measurement systems. Now they are deeply engaged in defining and developing those systems for their companies (Eccles, 1991). Unlike productivity and or quality measurement, where the parameter can be measured objectively and expressed in unit or ratio, supply chain measurement is currently more of a qualitative statement.

The objective of this study is to develop an easy and simple way to measure quantitatively the performance of an Apparel supply chain in Bangladesh and find the metrics to measure Aboni Knitwear Ltd. (AKL)'s supply chain efficiency. Before doing that some literatures similar to this study have been reviewed.

2. Literature Review

Supply Chain Operations Reference (SCOR) model was used to evaluate supply chain performance of Pt.Yuasa, Indonesia (Sudaryanto & Bahri, 2007). SCOR model provides an integral and comprehensive performance measures and covering both external and internal facing environment comprising both operational and financial.

The Balanced Scorecard (BSC) presents a fairly comprehensive model for evaluating supply chains. However, even BSC has its shortcomings and the suggestions were given to overcome some of its shortcomings by considering the case of the petroleum supply chain (Varma & Deshmukh, 2009). By elevating the BSC from organizational level to industry level it can be used for benchmarking one supply chain against another; something which is not possible with the way BSC is being used currently. This can substantially enhance the flexibility of using BSC for performance evaluation. They also suggest a way to combine

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dissimilar metrics so that a single number can be obtained which signifies the performance of the supply chain.

The performance behavior of conjoined supply chains arises in web-based retail. Five performance measures, belonging to three performance measure classes, are used to study the performance effects of various operational factors on conjoined supply chains (Beamon et al, 2001). The study is accomplished via experimental design and simulation analysis, and the results suggest the effects of the various factors on supply chain performance and identify the nature of the relationships among these factors and overall supply chain performance.

A framework to promote a better understanding of the importance of SCM performance measurement and metrics was developed by using the current literatures and the results of an empirical study of selected British companies (Gunasekaran et al, 2004).

The most advanced state in the evolutionary development of purchasing, procurement and other supply chain activities is found in some literatures (Thomas & Griffin, 1996). The literature is used in describing the general context within which measurement of supply chain performance is undertaken. They used three kinds of level for supply chain performance metrics framework. Strategic level measures include lead time against industry norm, quality level etc. Tactical level measures include the efficiency of purchase order cycle time, cash flow etc. Operational level measures include ability in day to day technical representation, adherence to develop schedule etc. The metrics and measures are discussed in the context of the following supply chain process: plan, source, make, delivery.

The reasons of lead time increase in Bangladesh Readymade Garments (RMG) were focused and suggestions were made to reduce lead time as well as develop their supply chain performance in RMG sector (Nuruzzaman & Haque, 2009).

3. Methodology

There are varieties of measurement approaches that have been developed and traditionally used for measuring supply chain performance. Apart from the wildly popularized Balanced Scorecard, there are other measurement approaches like Supply Chain Council's SCOR Model, the Logistics Scoreboard, Activity-Based Costing (ABC) and Economic Value Analysis (EVA) (Prabir, 2007).

SCOR model is designed and maintained to support supply chains of various complexities and across multiple industries. It spans all customer, physical and market transactions. This model is finally adopted to develop the measurement framework after a thorough investigation.

The Case Study has been done in Aboni Knitwear Ltd. (AKL). AKL is an important sister concern of the Babylon Group and has a 70,000 sq-ft floor area having 6 stories in the complex. It has 20 production lines with a capacity of producing about 300,000 pcs. of standard size garments per month.

Supply chain efficiency measurement framework is developed in terms of efficiency with respect to key functional parameters spanning four different operation domains namely source, plan, make and deliver (Prabir, 2007). There are five primary key performance indicators (KPI) identified in each operation domain. Each KPI is expressed in percentage. Once all KPI are measured, weighted averages of all KPI would indicate the overall supply

chain efficiency of the organization. Weightage on different KPI values are given based on management’s opinion. Higher the KPI, better the efficiency. While a 100% supply chain efficiency index would mean perfect organization, there is a possibility of any organization having KPI value more than 100 percent. Table 1 shows different KPI that can be measured to find out the overall supply chain efficiency.

Table 1: Different KPI described (Prabir, 2007)

| Operation domain | KPI's |
|------------------|--|
| Source | 1) Inward Material Quality |
| | 2) Quantity and Timely Delivery |
| | 3) Procurement Unit Cost |
| | 4) Material Inventory Level |
| | 5) Vendor Development Capability |
| Plan | 1) Adherence to Production |
| | 2) Sample Conversion Rate |
| | 3) Material Utilization |
| | 4) Cost Adherence |
| | 5) Planned T&A v/s Actual T&A |
| Make | 1) Capacity Utilization |
| | 2) Production Cost Efficiency |
| | 3) Quality Capability |
| | 4) Change Over Time |
| | 5) Operator Training Effectiveness |
| Deliver | 1) On Time Shipment |
| | 2) Order Fulfilment |
| | 3) Claims and Discounts |
| | 4) Quality at Delivery |
| | 5) Transit time |

All of these KPI are not needed or always possible to be measured. Due to lack of availability of data and resource in this study. Only selected four KPI values, one from each operation domain, have been measured. In table 1 these four KPIs are bolded.

3.1 Quantity and Timely Delivery

This parameter shall evaluate whether the quantity of raw material ordered is received on time or not. The time considered is a % of the lead time and quantity received is a % of the order quantity. However in case of late delivery the penalty shall be according to the % lead time delay and quantity received. As per matrix in table 2, the points are counted for each raw material received in last one month and average of the counted points gives KPI value if all raw material order is of same importance.

Table 2: Allotted points for Quantity and Timely delivery

| | | | | | |
|-------------|------|--------|--------|--------|------|
| Qty. Rcd. | 100% | 99-75% | 74-50% | 49-25% | >25% |
| Time delay | | | | | |
| 0 % | 100 | 70 | 50 | 30 | 0 |
| Upto 20 % | 70 | 50 | 30 | 10 | 0 |
| 21-50 % | 50 | 30 | 20 | 0 | 0 |
| >50 % | 0 | 0 | 0 | 0 | 0 |
| < 20% early | 30 | 40 | 50 | 70 | 80 |

3.2 Adherence to Production Target

This parameter measures actual production achievement in comparison to planned one. Production achievement is measured in terms of timely completion and fulfilment of the target. In this study KPI measures average hourly deviation of target production for sewing. Data was collected over a week and averaged. The KPI is calculated as

$$KPI = \frac{\sum \left(\frac{\text{Output}}{\text{TotalOutput}} \times \left(\frac{\text{Point s out of 100}}{100} \right) \right)}{\%}$$

The Points are allocated from table 3.

Table 3: On a scale of 100 points, the points allocated for Adherence to Production Target.

| | |
|----------------------|--------|
| Production completed | Points |
| 99-75% | 75 |
| 74-50% | 50 |
| 49-25% | 30 |
| less than 25% | 10 |

3.3 Quality Capability

Quality is the important key performance indicator. It can be determined by Defect per Hundred unit (DHU) levels. DHU level is the defect per hundred unit calculated at the final stage of each department. For example, in the sewing department it was calculated at final checking or audited stage, after the complete sewing of garments from the line. Data for one week have been collected and averaged. This KPI is calculated as

$$KPI = \frac{1}{DHU} \%$$

3.4 On-Time Shipment

Shipment at the exporter's end is just the delivery of goods. When the contract is made for an order, the buyer fixes a favourable date. If these goods are exported by the manufacturer as per scheduled date then it is termed as on-time shipment. While delay in shipment is of great concern, early shipment also draws a penalty. The KPI is calculated as

$$KPI = \frac{\sum (\text{Volume or Value of Order Shipped} \times \left(\frac{\text{Weightage point s out of 100}}{100} \right))}{\text{Total Value or Volume of Orders}} \%$$

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Last but not the least, the measurement parameters are chosen based on the functional link between upstream and downstream players in the supply chain and not merely in house functions of an apparel manufacturer.

4. Results and Discussion

Four calculated KPI values are as follows:

4.1 Quantity and Timely Delivery

Calculation for Quantity and Timely Delivery is shown in table 4. This KPI value is 56.67% as it is considered that all raw material orders have same weightage.

Table 4: Quantity and Timely delivery of Raw material supply for last one month

| Supplier | Lead time (a-days) | Time delay (b-days) | $\frac{b}{a} \times 100\%$ | Order Quantity (c) | Quantity Received (d) | $\frac{d}{c} \times 100\%$ | Points |
|----------------|-----------------------|------------------------|----------------------------|--------------------------|-----------------------------|----------------------------|--------|
| Fabric 1 | 5 | 2 | 40 | 0.55 Tons | 0.54 Tons | 98 | 30 |
| Fabric 2 | 20 | 10 | 50 | 1.20 Tons | 1.22 Tons | 102 | 50 |
| Button | 10 | 2 | 20 | 150,000 | 150,000 | 100 | 70 |
| Zipper | 10 | 2 | 20 | 10,500 | 10,500 | 100 | 70 |
| Thread | 30 | 10 | 33 | 5,000 | 5,000 | 100 | 50 |
| Polythene | 15 | 2 | 13 | 14,0000 | 14,0000 | 100 | 70 |
| Average Point= | | | | | | | 56.67 |

4.2 Adherence to Production Target

From Table 5, it is found that $\Sigma \text{Output} \times \text{Points} = 54685$ and Total Output = 978. So,

$$KPI = \frac{54685}{978} \% = 55.92\%$$

Table 5: The sewing figure of one week for Aboni Knitwear Ltd

| Line No. | Buyer | Target output per Hour | Total Output | Average Output per Hour | % completed | Points | Average output X Points |
|----------|---------|------------------------|--------------|-------------------------|-------------|--------|-------------------------|
| 1 | H&M-1 | 122 | 1265 | 105 | 86 | 75 | 7906 |
| 2 | H&M-2 | 124 | 1255 | 105 | 84 | 75 | 7844 |
| 3 | ZARA-1 | 115 | 670 | 56 | 49 | 30 | 1675 |
| 4 | ZARA-2 | 120 | 1020 | 85 | 71 | 50 | 4250 |
| 5 | H&M-3 | 221 | 1300 | 108 | 49 | 30 | 3250 |
| 6 | ZARA-3 | 117 | 905 | 75 | 64 | 50 | 3771 |
| 7 | MONO-1 | 240 | 1800 | 150 | 63 | 50 | 7500 |
| 8 | TESCO-1 | 179 | 1835 | 153 | 85 | 75 | 11469 |
| 9 | MONO-2 | 202 | 1685 | 140 | 70 | 50 | 7021 |
| | | | SUM | 978 | | | 54685 |

4.3 Quality Capability

In the sewing department at final checking or audited stage it was calculated that average DHU= 4.17. So,

$$KPI = \frac{1}{4.17} \times 100\% = 23.98\%$$

4.4 On-Time Shipment

The order fulfilment on the shipment date in last one month has been given in Table 6.

Table 6: The KPI Value of order fulfilment for Aboni Knitwear Ltd.

| Buyer's Name | Order Quantity (pcs) | Actual shipment Qty (pcs) | Weightage Points | Actual shipment Qty × Weightage Points |
|---------------|----------------------|---------------------------|------------------|--|
| H & M | 23100 | 17411 | 100 | 1741100 |
| KIABI | 10860 | 10860 | 100 | 1086000 |
| Tesco | 12500 | 7860 | 100 | 786000 |
| ZARA | 42700 | 38355 | 100 | 3835500 |
| H & M Order 2 | 50755 | 45700 | 100 | 4570000 |
| Total= | 139915 | | | 12018600 |

So from the table 4,

$$KPI = \frac{12018600}{139915} \% = 85.9\%$$

4.5 Overall KPI Value

Overall KPI value is obtained by calculating the weighted average of all individual KPI values mentioned earlier. As summarized in table 7 the overall KPI value that is the Supply chain efficiency of AKL is 61.85%.

Table 7: Overall KPI or Supply Chain Performance of AKL

| KPI | KPI value | Weightage | KPI value × Weightage |
|--------------------------------|-----------|-----------|-----------------------|
| Quantity and Timely Delivery | 56.67 | 30% | 17.00 |
| Adherence to Production Target | 55.92 | 20% | 11.18 |
| Quality Capability | 23.98 | 15% | 3.60 |
| On-Time shipment | 85.9 | 35% | 30.007 |
| Total | | | 61.85 |

5. Conclusion

Supply chain performance evaluation is an important factor in garments factory. This evaluation can accelerate the productivity of the factory. Performance measurement describes the feedback on operations which are geared towards customer satisfaction and strategic decisions and objectives.

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The overall supply chain efficiency of AKL is not high enough to compare with world class organizations. Only KPI value of on-time-shipment is well. Other KPI can be enriched by giving sufficient focus on those and applying TQM. Enrich of backward linkage, quality level, labour and line efficiency will definitely improve the overall supply efficiency of the organization. To bring about improved performance in a supply chain and move closer to attainment of the real goal of supply chain optimization, performance measurement and improvement studies must be done throughout the supply chain.

End Notes

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