

How the performance measurement of supply chain contributes in achieving organisational objectives of Sri Lankan apparel organisations

U. N. Narawita

Department of Transport and Logistics Management
University of Moratuwa
Sri Lanka
narawitau@gmail.com

L.D.C.S Layangani

Department of Transport and Logistics Management
University of Moratuwa
Sri Lanka
layangani@gmail.com

Abstract- Half way through the evolution of supply chain management, the measurement of performance became an important component to the successful implementation of its concepts and practices. The intense competition in the apparel manufacturing industry has encouraged the players to focus not only on the profitability of their businesses but also on the elements such as supplier - customer relationship management and optimization of every single echelon along the supply chain. This research presents a detailed study and an analysis carried out to determine the impact of the performance measurement systems established in apparel companies on their organizational objectives in Sri Lankan context.

The apparel manufacturing companies involve in export trade that are registered under Export Development Board were considered as the population and the apparel exporting organisations which are registered under Sri Lanka Apparel Exporters' Association were considered as the sample for this research. All the data is gathered via an online questionnaire and focus respondents are the senior level managers in these apparel manufacturing organizations. In the data analysis phase, the Cronbach's alpha, the principal component analysis and regression analysis became extensively useful.

The analysis and the conclusions are solely based on the data collected from the apparel organizations in the export industry and not having even a single representation from non-exporting small scale apparel organisations is seen as a main limitation of this study. This research brought into light that measurement of organisational performance has favourable as well as antagonistic impact on organisational performances, therefore organisations should identify the tradeoffs and set division targets accordingly.

Key Words- Performance measurement, organizational objectives, apparel organisations

I. INTRODUCTION

Supply chain management is becoming a vital area in competitive businesses around the world which should be given management attention in order to win customers. Around 1950s, "Logistics" played a major role in military activities. Subsequently, as a more improved concept the Supply Chain Management was developed. Though Logistics can be defined as managing the material and information flow within one organization, Supply chain has a broader scope across inter organizational boundaries.

Supply chain management mainly focuses on all the processes from the source of supply to the end consumer and integration of all the processes through conversion/ production processes and distribution channels. (International Center for Competitive Excellence, 1994) Therefore, each and every echelon along the supply chain should be carefully managed in order to ensure the benefits are squeezed out.

When it comes to any profit oriented organization, the ultimate objective is to maximize the wealth of shareholders, which will ultimately fulfill the objectives of other stakeholders as well. Specially, when the organisations measure performance in different operational areas, consequently an environment gets created inside the organisation with performance targets and reward systems. As a result, the employees who pursue these performance targets contributes in achieving organisational objectives.

The Apparel industry being an industry, which has opened up the doors for 15% of the total work force and accounts for half of the total exports of Sri Lanka, should be given adequate attention to enhance the further opportunities around the around. Therefore, the area of supply chain management plays a vital role for the organizations to achieve business globalization and rest of the organizational objectives.

In conclusion, this research provides a better understanding on the behaviour of the supply chain related key performance indicators (KPIs) and how the decisions made based on these measurements would ultimately impact the performance and the objectives of the organisation.

II. RESEARCH QUESTIONS, OBJECTIVES AND PURPOSE

This study fundamentally focuses on three aspects related to measurement of supply chain performance in apparel organisations as follows:

Q01: In the contemporary business environment, what are the supply chain performance measurements which are commonly used in apparel organisations in order to achieve the business objectives of Sri Lankan Apparel Companies?

Q02: How do the measurements of performance and the decisions made based on the interpretations will impact the apparel organisations in a favourable manner?

Q03: How do the wrong interpretations made based on the performance indicators prevent organisations from achieving the organisational objectives?

Basically, this research study focuses on the performance measurement systems in the Sri Lankan Apparel industry. Since supply chain operations is a vital aspect in apparel industry, it is expected to examine the impact of supply chain related performance measurements in achieving the objectives of the organisation. The research objectives are as follows:

Objective 01: Determine the performance measurements that are widely being used in the apparel industry.

Objective 02: Based on empirical evaluations of performance measures and metrics established within supply chain environments of Sri Lankan apparel organizations, identify the areas of business that have been directly benefited other than the profitability.

Objective 03: Examine how the apparel organisations can eliminate wrong interpretations and avoid being negatively impacted by over dependency on KPIs.

The performance measurement should be aligned in such a way that the whole organization is working towards achieving above organizational objectives which ultimately contributes in achieving the profit maximizing objective. In this study, it is expected to examine the significance of the performance measurement systems towards achieving these organisational objectives. In addition, the antagonistic nature of some performance measurements is also likely to be analysed using the multiple linear regression model.

III. LITERATURE REVIEW

A. Supply chain evolution

During the 1960s, the organizations managed their activities and allocated responsibilities under three key pillars: Marketing, Finance and Production. Not having a proper understanding on the cost tradeoffs and sub optimization led organizations to deviate from the optimum performance levels. Reference [1] pointed out that, though the air freight is costly, the organizations can maintain lower inventory levels on both ends of the shipment as a result of faster and guaranteed service.

The establishment of supply chain division as a new function within the organisation contributed to bring total cost concept in to play. The cost conflict activities such as inventory management and transportation were merged and managed

much effectively with better coordination. This approach has directed and opened up opportunities for the organizations to integrate with different other organizations in their supply chain and the concept of Supply Chain Management came up as a more collaborative and integrative approach with a broader scope for a manufacturing organization.

B. Present and future trends and supply chain scope

As the competitiveness gets intensified in the apparel industry of Sri Lanka, most of the apparel companies tend to adopt supply chain management strategies as a competitive tool in order to get the competitive edge over their competitors. In some companies the procurement and production functions are also operated under supply chain department which accounts for 70-80 percent of the cost of sales [2].

The structure and the scope of supply chain change over time based on varying customers and their requirements [3]. Reference [2] highlighted that supply chain management has three dimensions: activity and process administration (Warehousing, transportation, inventories), inter-functional coordination (maintaining relationships with other functional areas in the entity), and inter-organizational coordination (coordination with the other echelons of the supply chain).

The optimum level of supply chain management is where despite individual organizations, the respective supply chains compete with each other in the competitive battle. Subsequently, Reference [4] emphasized mainly eight sub-categories of supply chain, adding new dimension covering all manufacturing, supplier and consumer related areas.

- Customer relationship management
- Customer service management;
- Demand management;
- Order fulfillment;
- Manufacturing flow management;
- Supplier relationship management;
- Product development
- Waste management

In conclusion, as reference [5] stated, the apparel organizations should identify the critical areas of supply chain and develop new measurement systems which will enable to draw management attention to optimize and improve the modern supply chain operating format.

C. Performance measurement and enhancement

When measuring the performances of supply chain, it is important to eliminate; optimization at single point/ interface/ echelon ignoring optimization on other echelons in the chain while understanding the cost tradeoffs. Therefore, the performance measurements should be laid taking in to consideration the entire supplier chain and the cross functional processes.

D. Plan Performance

Once the orders are received by the customer, the apparel companies should manage their functions effectively in order to execute the downstream functions properly. The time it takes for the procuring process has an impact on the whole order cycle time and the total cash flow time. Moreover, the decisions that have been taken by apparel companies in order to cut down the order cycle time support these entities to reduce the supply chain response time which acts as a competitive advantage [6].

E. Source Performance

Measurement of supplier performance is critical towards thriving performance in apparel industry. As per the study conducted by reference [7] it was revealed that outsourcing and other partnerships contribute 50 percent on average, of the goods produced by the manufacturer. Since apparel industry is a very dynamic, the responsiveness and the reliability of the suppliers and other parties plays a major role when introducing new product to the market.

F. Production performance

Basically, the apparel companies are capable of implementing Manufacturing Cell concept in order to perform parallel operations by cross functional teams which would increase the plant efficiency by reducing the idle time and order cycle time. Capacity utilization of apparel plants are also important to determine the flexibility and deliverability of the supply chain reference [8].

G. Delivery performance

Since delivery performance can be considered as a marketing tool to attract the end customers, delivery performance accounts for a significant stake in customer service and satisfaction. Reference [2] suggested delivery performance as the “driver of customer satisfaction” and frequent fluctuations in delivery times lead to a substantial reduction in delivery reliability.

H. Customer service and satisfaction

Customer service and satisfaction is a main aspect of organizational objectives in order to retain the customer in the longer run [21].

Most importantly, the flexibility of the supply chain has a huge impact on the supply chain response time. The advanced manufacturing technologies, online information and information technology help to identify the exact customer requirement, win the customers over competitors and retain them in long term. The after sales services and measuring customer perception are vital aspects towards the success in the apparel industry [9].

IV. METHODOLOGY

Lack of similar kind of research studies for Sri Lankan Apparel context has led this research to be focused on that particular area even though similar research studies have been previously conducted for various other contexts.

The data required for analysis were gathered via questionnaires which were circulated among the senior managers of apparel exporting organisations in Sri Lanka.

Couple of interviews were conducted in order to obtain a clear view on the practical application of supply chain principles in organizational environment.

All the apparel manufacturing organisations which are registered under ‘Sri Lanka Exports Development Board’ (300 organisations) were considered as the population. The apparel organisations which are registered under ‘Sri Lanka Apparel Exporters Association’ (74 organisations), which is a subset of the organisations which are registered under ‘Sri Lanka Exports Development Board’, were chosen as the sample of this study.

A. Data collection

The questionnaires were distributed among the personnel those who represent the senior management in these organisations. The copies of the questionnaire were distributed among the respondents via survey monkey, e-mails and hand delivery. Summary of all the collected 34 responses, which resulted in a response rate of 46%, were recorded in a Microsoft Excel sheet for analyzing purposes.

In the interviews conducted, the focus was given on organisation’s perspective of how the key performance indicators under five areas; plan, source, make, deliver and customer service levels, are set to ensure better organisational performance.

In addition, quantitative data related to Sri Lankan apparel export industry was obtained from the website of Sri Lanka Export Development Board and from other reports consist of export data.

B. Data analysing

MS Excel and SPSS applications were used to analyze the data gathered by the questionnaire. Firstly, the standard deviation was calculated for each sub category (plan, source, production, delivery, and customer satisfaction & service levels and organisational objectives) in each survey response to inspect whether the respondent has followed a particular pattern when filling the questionnaire. If the standard deviation values are lower than 0.5, the responses were assumed to be followed by a specific pattern. The responses that were identifies as following a specific pattern were removed from further analysis.

Several responses for “number of employees” were kept blank by some respondents in the returned questionnaires and using the “Replace missing values” option in SPSS, the missing data were replaced with series mean.

Based on the average and percentage values of the available data set, an evaluation on demographics of the sample was conducted. Skewness values were calculated to measure the degree of asymmetry in the distribution of responses which demonstrates the biasness towards a particular preference in the five point Likert scale. It was assumed that if the skewness is greater than 1 or lesser than -1, the distribution is subject to substantial deviation [10]. The Kurtosis values which are greater than 2 and lesser than -2 were considered as highly peaked and flattened respectively. Based on the values of Kurtosis and skewness, the KPIs that are commonly used in apparel organisations could be determined. Cronbach’s α was calculated to assess the reliability of each scale where the value

is greater than 0.7 the scale was assumed to be reliable [5]. After eliminating negatively and weakly correlated items (2.9 Order lead time, 2.18 Mutual assistance in solving problems, 2.20 Purchase order cycle time, 2.28 Number of faultless deliveries) from further analysis, the Cronbach's α values derived for scales 'Plan Performance', 'Source Performance', 'Production Performance', 'Delivery Performance', 'Customer Satisfaction and Service Levels' and 'Organisational Objectives' were 0.795, 0.781, 0.837, 0.781, 0.742, 0.956 respectively.

The principal component analysis was used to identify the independent and dependent variables that are with common characteristics/ correlations and to reduce the total number of variables to a lesser number of underlying variables. Thus, the factor reduction made it convenient to develop two concise regression models. KMO and Bartlett's test of sphericity was used to verify the sample adequacy and the appropriateness of using factor analysis to the data set. It was assumed that if the KMO measure is greater than 0.5, the sample is adequate [12]. The factor extraction was done using principal component analysis based on the Eigen value greater than 1. Varimax rotation was used to construct the rotated component matrix. For convenience purposes when identifying underlying factors in rotated component matrix, small coefficients with absolute value below 0.5 were suppressed. The multiple regression analysis was used to identify the relationships between thirteen performance measurement underlying variables and two organizational objectives underlying variables. The significant correlations between performance measurements and organisational objectives were identified based on the 'p' values which are lesser than 0.05 and considered for interpretations.

C. Sample demographics

Based on the data gathered via questionnaire, all thirty-two apparel companies export their products to other countries such as USA, UK, Europe, Canada, Japan etc. 12.5% of the organisations (four organisations) employed more than ten-thousand workers in their production plants, while 25% of the organisations (eight organisations) employed less than 1000 employees. Based on the data provided, the USA, Europe, UK, Japan, Canada and Asia were the main regions to which the apparels are exported by Sri Lanka. Among these countries, USA play a major role as a customer in the success of the businesses, which has accounted for USD 1.1 billion revenue (Sri Lanka Apparel Exporters Association) out of the total sale made USD 2.7 billion in the first half of year 2014. Out of thirty two responses, 27 respondents have mentioned USA as one of their customers, which is as high as 84%. In addition, 59%, 16%, 25%, 44%, 9% of the respondents have stated that they export apparel to Europe, UK, Japan, Canada and Asia respectively.

V. ANALYSIS AND DISCUSSION

In the analysis executed using SPSS, four highly left skewed performance measurements/ key performance indicators (Range of products and services, manufacturing costs, incoming stock, measurement of customer satisfaction factors) could be identified. 'Manufacturing cost' and 'Measurement of customer satisfaction factors' were identified as having highly peaked Kurtosis values (>2) in the analysis. These results

denote that the apparel organisations closely monitor and commonly use these performance measures in their decision making process.

Using principal component analysis, the performance measurement variables were reduced down to thirteen performance measurement underlying independent variables and two organisational objective dependent underlying variables as follows. The following chart further illustrates the results of the regression analysis as well. The underlying independent variables are lined down the first column. The Obj (i) and Obj (ii) are 'Overall competitive position' and 'Overall performance' respectively.

The Table I illustrates the summary of correlations in the two regression models. Based on the survey results and the analysis, it reflects KPIs have positive as well as negative correlations between the two objectives in separate regression models. The negative correlations suggest that over dependency on some performance measurements without identifying the tradeoffs and hidden relationships between variables, leads to adverse impact on organisational performance. The positive correlations demonstrate favourable impacts on organisational performance. Identification of such related performance measures, setting adequate targets and monitoring the results in order to make important decisions associated with the interpretations of the outcomes bring out positive impacts on organisational performances.

TABLE I. THE SUMMARY OF CORRELATIONS IN BOTH REGRESSION MODELS

Independent variables	Coefficient Obj (i)	Coefficient Obj (ii)
Adjusted R Square	0.764	0.976
Plan (i): Effectiveness of the investment decision	n/a*	n/a*
Plan (ii): Timeliness to market	n/a*	.527
Plan (iii): Organisational capabilities in demand management	-2.786	-.875
Source (i): Mutual problem solving abilities	n/a*	-1.159
Source (ii): Supplier reliability	1.464	.898
Source (iii): Supplier attractiveness	1.253	.799
Production (i): Inventory measurements	n/a*	-1.053
Production (ii): Production scheduling	-1.984	-1.416
Production (iii): Manufacturing resource utilization	2.524	1.861
Delivery (i): Mutual understanding in managing deliveries	-3.028	-2.104
Delivery (ii): Delivery expectations of the customer	n/a*	1.675
CS(i): Customer service quality	3.739	3.163
CS(ii): Customer satisfaction	-3.895	-1.988

n/a*: related correlation is insignificant

The both regression models have adjusted R square values higher than 0.7 which ensures the fact that more than 70 percent of the variability can be explained by these two multiple linear regression models.

Estimations of plan, source, production, delivery and customer satisfaction performance have a significant impact on the organisational objectives. When setting the key performance indicators and set performance targets for divisions and individuals, apparel organisations should observe the holistic view and identify the every string attached. The following table illustrates the summary of the coefficients of performance measurements to the organisational objectives.

The sample consists of highly diversified apparel organisations in terms of number of employees as well as the countries which export apparel to. Since all the organisations considered in this sample involve in export industry, the organisations are concerned about a range of organisational objectives. Among them product quality, financial objectives, customer attraction, improvements in the internal environment and customer service levels are leading considerations. The organisational performance are affected by numerous factors and sometimes the number of factors is uncountable or inseparable from each other. The decisions, the KPI targets and measurements differ based on the seasonality factors [13]. Moreover, with the changing business priorities over time, the importance of each performance measurement or the key performance indicator diverge from time to time. However, based on the skewness and kurtosis analysis the performance measures such as measures on product portfolio, cost of manufacturing, raw material inventory, and measurements on customer satisfaction seem to be vital measures in apparel manufacturing environment.

The regression models demonstrates how some performance measures/ independent variables exhibit antagonistic characteristics with the dependent variables. Therefore, apparel organisations need to conduct a tradeoff analysis prior setting divisional targets and making important decisions based on the interpretations.

VI. CONCLUSIONS AND RECOMMENDATIONS

The apparel exports in Sri Lanka account for half of the total exports and half of the total Sri Lankan apparel exports are to USA. Therefore, apparel industry plays a vital role in Sri Lankan economy and similarly USA has a critical relationship with the Sri Lankan apparel export industry.

When analysing the quantity values and the financial values of the top five apparel products exported to USA by Sri Lanka since 2002, it is clearly visible how the financial values have increased despite the decline in quantity. Obviously the growth in sales value has been achieved by increasing unit price while providing high quality products where the supply chain excellence has come in to play.

Consequently, this encourages the apparel organisations to be highly quality concern. Specially, the apparel organisations should agree on quality measures with suppliers and regularly

monitor supplier delivery performance which will enable them to follow any corrective actions needed. The organisations should frequently keep track on supplier's interest in developing partnerships. This will facilitate negotiations between suppliers and the organisations to source high quality products at lower rates than in the industry.

The organisational objectives cannot be achieved by focusing solely on each area of performance measurements in isolation. The performance measures to be more meaningful the KPIs should be integrated with production, customer, plan and delivery performance measures as well. The results of the regression analysis suggest that measuring performance and setting targets in an arbitrary manner with poor coordination will not enable apparel organisations to extract expected favourable outcomes. The antagonistic impact of some variables will neutralize the expected positive impact on organisational objectives. Therefore, the senior management should identify their critical success factors and define strategic objectives for the organisation in such a way that they can capitalize based on their strengths. Afterwards, the KPIs should be laid aligned with strategic objectives in the functional areas with targets assigned to employees.

The functional areas associated with independent variables that demonstrate a negative correlation with the objectives have antagonistic impacts. For instance, as stated in the finding, the negative correlation between "Delivery (i): Mutual understanding in managing deliveries" and "Obj(i)" or "Obj(ii)" suggests that devoting excessive management time on non-core activities makes it incapable for the apparel organisations to derive the expected favourable outcome. Therefore, in that case, if the management believes that devoting such time brings out no benefit to them, but still in order to retain the customer particular activity (i.e. information richness in deliveries) is vital, organisations can outsource (i.e. outsource information handling in deliveries to Expo Lanka) that activity to avoid internal as well external issues. However, the reliability of the outsource party is very important that ensure the confidentiality of data.

In conclusion, the apparel organisation cannot achieve their organisational objectives by solely focusing on the performance measurement systems. Over dependency on KPIs, complex relationships in organisational activities, culture and seasonality can lead to unexpected behaviour of performance, nullifying efforts put in to achieve excellence (i.e. increase in customer service levels at the expense of production cost). Therefore, the organisations should evaluate their own internal and external environments and recognise the best suit measurements of performance.

VII. FUTURE RESEARCH AREAS

Findings of this research can be further extended in future research. This research study considers the impact of the performance measurement systems only in apparel organisations in Sri Lanka. The same study can be conducted to different manufacturing environments. In addition, with the evolution of supply chain, the future trend is not the individual

organisations but the entire supplier chains compete with each other and share the benefits accordingly. Therefore, in future, the same study can be conducted considering the entire supply chain.

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