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Sustaining Performance of Supply Chains Through Benchmarking - A Case Study of Darjeeling Tea

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Abstract

Benchmarking is a relevant tool in studying the supply chain by measuring a company's product, services and processes, and comparing them against the relevant metrics of a successful firm. Gomes present the case study based on tea industry in Darjeeling, a district of West Bengal, India. Using a sample of ten units and four parameters. This paper attempts to answer the question as to how units/firms can apply and move to more scientifically managed supply chain practices, and sustain as well as improve their performance.

Keywords: Performance; Supply Chain; Benchmarking; Data Envelopment Analysis; Darjeeling Tea.

Introduction

Supply chain management is an exploding field, both in research and in practice. Major international consulting firms have developed large practices in the supply chain field. The number of research papers in this field is growing rapidly. Supply chain management (SCM) is the term used to describe the management of the flow of materials, information, and funds across the entire supply chain, from suppliers to component producers to final assemblers to distribution (warehouses and retailers), and ultimately to the consumer. In fact, it often includes after-sales service and returns or recycling. In contrast to multi-channel inventory management which coordinates inventories at multiple locations, SCM typically involves coordination of information and materials among multiple firms.[1]

> According to Handfield and Bozarth (2006), "Supply Chain Management is defined as the active management of supply chain activities and relationships in order to maximize customer value and achieve a sustainable competitive advantage. It represents a conscious effort by a firm or group of firms to develop and run supply chains in the most effective and efficient way possible."[2]

Supply chain management has generated much interest in recent years for a number of reasons. Many managers now realize that actions taken by one member of the chain can influence the profitability of all others in the chain. Firms are increasingly

1 A. Charnes , W.W. Cooper & E. Rhodes, "Measuring Efficiency of Decision-making Units", in *European Journal of Operational Research,* Vol. 2, 1978, 429-444.

2 R.B. Handfield & C. C. Bozarth, *Introduction to Operations and Supply Chain Management,* New Delhi, Pearson Education, Inc., 2006.

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thinking in terms of competing as part of a supply chain against other supply chains, rather than as a single firm against other individual firms. Also, as firms successfully streamline their own operations, the next opportunity for improvement is through better coordination with their suppliers and customers.

It seems that integration, long the dream of management gurus, has finally been sinking into the minds of western managers. Some would argue that managers have long been interested in integration, but the lack of information technology made it impossible to implement a more "systems-oriented" approach. Researchers dating back to the 1950's,[3] have maintained that supply chains should be viewed as an integrated system. With the recent explosion of inexpensive information technology, it seems only natural that business would become more supply chain focused. However, while technology is clearly an enabler of integration, it alone can not explain the radical organizational changes in both individual firms and whole industries. Changes in both technology and management theory set the stage for integrated supply chain management. One reason for the change in management theory is the power shift from manufacturers to retailers. While integration, information technology and retail power may be key catalyst in the surge of interest surrounding supply chains. E-business is however fueling even stronger excitement. E-business facilitates the virtual supply chain, and as companies manage these virtual networks the importance of integration is magnified. Supply chain management is an enormous topic covering multiple disciplines and employing many quantitative and qualitative tools.

Supply chain management can involve different areas, where each area represents a supply chain issue facing the firm and for any particular problem or issue, managers may apply analysis or decision support tools. Twelve such areas have been identified:[4] location, transportation and logistics, inventory and forecasting, marketing and channel restructuring, sourcing and supplier management, information and electronic mediated environments, product design and new product introduction, service and after sales support, reverse logistics and green issues, outsourcing and strategic alliances, metrics and incentives and global issues. The paper concentrates in the area of Metrics and incentives which examines measurement and other organizational and economic issues. This category includes both measurement within the supply chain and industry benchmarking.

Benchmarking is used to identify what management practices are worthy to be applied in a particular unit in order to achieve performance goals. Most importantly, it is a very popular technique adopted by organisations for understanding their performance in relation to their competitors. First generation benchmarking, concentrated towards realization of a breakthrough in performance through the identification of best practices

3 J. W. Forrester, "Industrial dynamics: A major breakthrough for decision makers", *Harvard Business Review,* Blackwell Publisher, 1958.

4 M. E. Johnson & D. F Pyke, A Framework for Teaching Supply Chain Management, Production and Operations Management Society, 2000.

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that contribute to performance improvement. It was like learning quickly from others in order to keep ahead of the competition and therefore create a new performance standard.[5] Companies have applied the benchmarking approach for improving specific business processes that transforms profitability. Xerox Corporation, Kodak, AT&T, American Express, 3M, etc. have successfully used the technique in their respective companies. The second generation of benchmarking included descriptions of the best practices employed by the leading firms. The advanced application of benchmarking can be in the areas of strategic planning, change management, process reengineering, knowledge management, advanced problem solving, etc.[6]

Previous research on benchmarking often emphasizes on internal performance metrics. It has paid little attention to the importance of collaboration metrics that span across companies. It is limited to an individual company as a part of supply chain. However, a new relationship amongst independent and related members of the supply chain by which a new type of benchmarking emerges, involves more than one company.[7]

Opportunities and Challenges for Sustainable Performance in a Mountain Economy

The issue of benchmarking supply chains for sustainable and enhanced performance in a mountain economy has become more important. Its relevance can be viewed from the following three perspectives:[8]

a. Globalization:

i. Global markets and competition will lead to changes in scope, scale and lead time adding complexity in planning and execution.

ii. Mixing culture and races affecting market profiles will change supply chain plans.

iii. Production resources including skilled workers will be globally distributed even more, leading to higher lead time and uncertainty.

iv. Global democratization will lead to new markets, hence increasing complexity and lead time.

v. SMEs will become a part of the global network. But this will need organizational changes.

5 D.A. Gravin, "Building a Learning Organisation", *Harvard Business Review,* Vol. 71, No. 4, 1993, 78-81.

6 C. Bogan & D. Callahan , "Benchmarking in Rapid Time", *Industrial Management,* Vol. 43, No. 2, 2001, pp. 28-33.

7 J.R.W. Cox, L. Mann & D. Samsom, "Benchmarking as a Mixed Metaphor: Disentangling Assumptions of Competition and Collaboration", *Journal of Management Studies,* Vol. 34, No. 2, 1997, 285-314.

8 G. Soni & R. Kodali, "Evolution of Supply Chain Management: Developments in Academia and Industry", *The ICFAI Journal of Supply Chain Management,* Vol. 5, No. 4, December 2008.

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vi. Global companies will be perceived as local and their growing size will require them to be self-governing and learning like a complex biological organism.

b. Information Technology:

i. Betterment in knowledge sharing and communications will enhance competitive climate.

ii. Market visibility and communications will rapidly improve to enhance speed of information flow and product traceability.

iii. More real time applications and decision support systems will be required.

iv. High connectivity of IT supported systems will make it possible to fulfill orders from various sources in real time, using virtual supply chains.

v. Advancement of IT will enable quicker organizational learning and knowledge.

c. Environmental concerns:

i. Persistent pressure to replenish natural resources by improving design and technology will need modifications in manufacturing and supplier base.

ii. Regulatory norms on recycling will impact supply chain design.

iii. Reverse logistics will be indispensable in supply chain decisions which will involve issues such as product disassembly for reuse, remanufacturing, product traceability.

iv. Reduced dependence in natural resources will make supply chains more stable and sustainable.

v. Constant increase in pressure on supply chains to use environment-friendly materials in production, distribution, usage and disposal will affect production technologies, and hence, the partners.

Data Envelopment Analysis and Benchmarking

Data Envelopment Analysis (DEA) can be used to find out benchmarking units based on various parameters having effect on performance of companies, also known as Decision Making Units (DMUs), at the inter-company level. DEA is a multi-factor productivity analysis model for measuring the relative efficiencies of a homogenous set of DMUs.[9]

The case study is based on tea industry in Darjeeling, a district of West Bengal, India. A sample of ten units is selected and four parameters have been considered for the study -

9 S. Parthasarathy & Talluri Srinivas, Decision Line in "Data Envelopment Analysis: Models and Extensions", Kluwer Academic Publisher, 2000, pp. 8-11.

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(a) Input variables:

(i) Number of requisitions on suppliers; and

(ii) Average number of employees on roll;

(b) Output variables:

(i) Number of export orders; and

(ii) Number of domestic orders;

The technical efficiencies (TE) have been calculated by using both the DEA models - Constant Returns to Scale (CRS) as well as Variable Returns to Scale (VRS). The DEAP version 1.2 has been used for the present study. The efficiency scores of all the DMUs are presented in Table 1.

Table 1 : EFFICIENCY SUMMARY

DMUs	TECHNICAL EFFICIENCY		SCALE EFFICIENCY	
	CRS DEA (CRSTE)	VRS DEA (VRSTE)	SCALE = (CRSTE/VRSTE)	NATURE OF SCALE INEFFICIENCIES (RETURNS TO SCALE)
1	0.593	1.000	0.593	DECREASING
2	0.936	1.000	0.936	DECREASING
3	0.452	0.602	0.751	DECREASING
4	1.000	1.000	1.000	CONSTANT
5	0.732	0.917	0.798	DECREASING
6	0.613	0.681	0.900	DECREASING
7	1.000	1.000	1.000	CONSTANT
8	0.764	0.831	0.919	DECREASING
9	1.000	1.000	1.000	CONSTANT
10	0.299	0.300	0.996	INCREASING
MEAN	0.739	0.833	0.889	

The above summary indicates the nature of inefficiencies and where the individual DMUs are presently operating. For the purpose of benchmarking, the peer(s) were identified as in Table 2 along with their peer weights of the inefficient DMUs.

Table 2: SUMMARY OF PEERS AND PEER WEIGHTS

DMUs	PEER 1	WEIGHTS	PEER 2	WEIGHTS	PEER 3	WEIGTHS
3	7	1.000				
5	2	0.091	7	0.909		
6	7	1.000				
8	9	0.458	7	0.115	2	0.427
10	9	1.000				

The other DMUs did not have any peer(s). The benchmarking process helps to determine the revised targets - on the basis of projections of the inefficient DMUs 3, 5, 6, 8 and 10 so that they can improve themselves accordingly.

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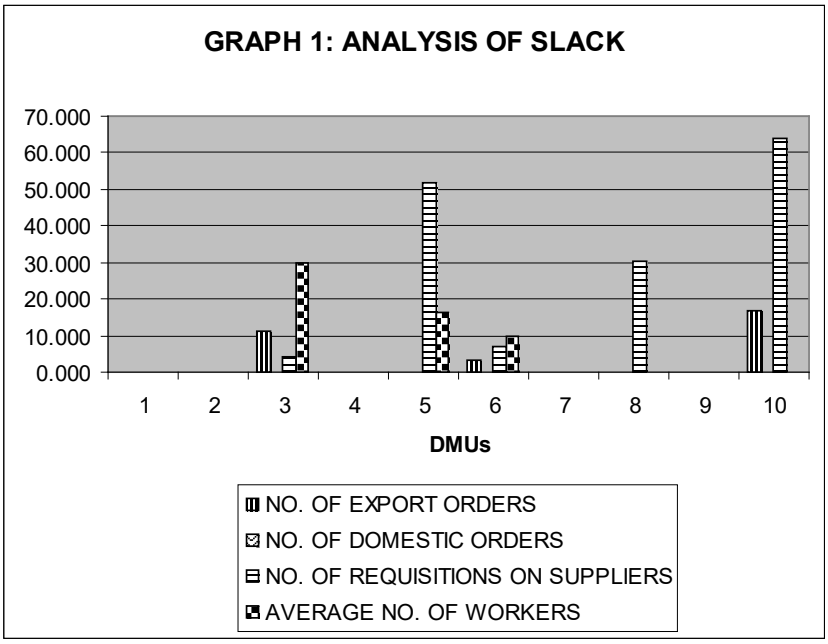
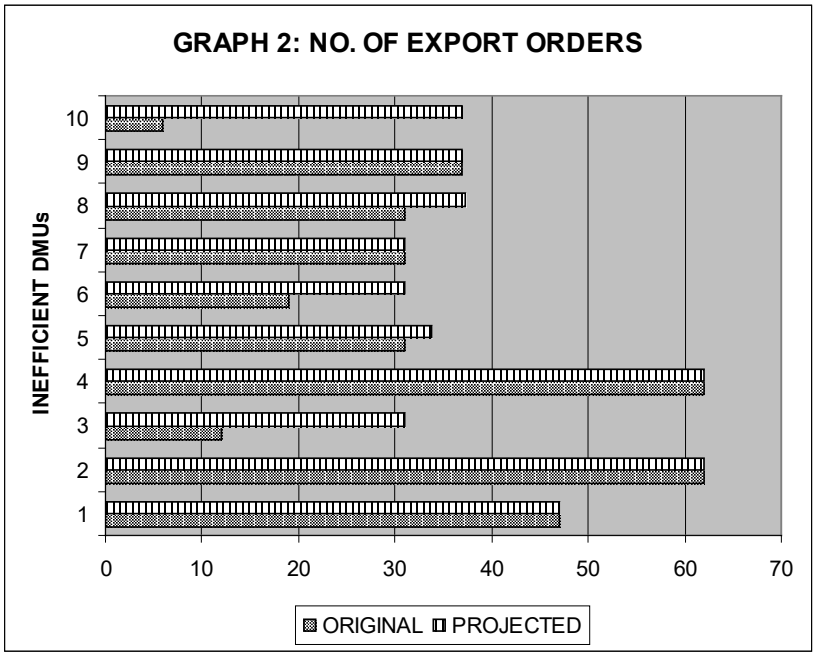
The output and input slack related to the DMUs have been presented in Graph 1 as below.



It is to be noted that the slack has been reported by those DMUs which are inefficient - DMUs 3,5,6,8 and 10. On the basis of the analysis, projections for the output factor - number of export orders were made for the inefficient DMUs 3, 5, 6, 8 and 10 which has been graphically presented in Graph 2 as below.



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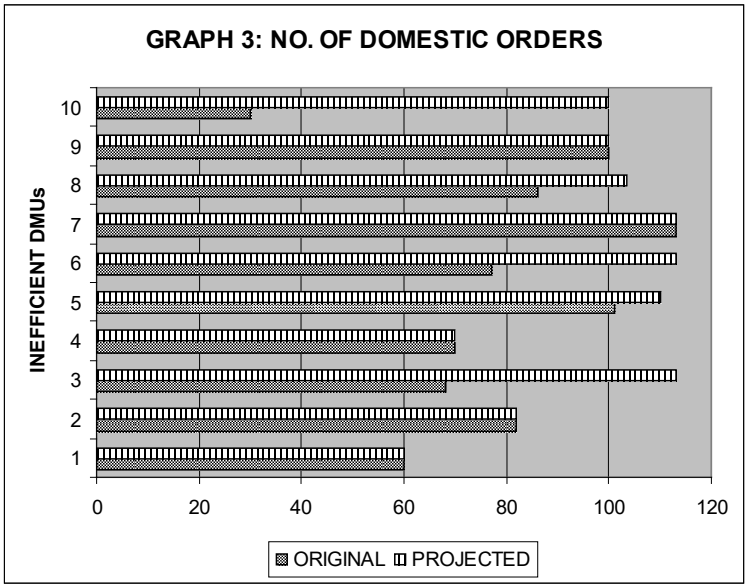
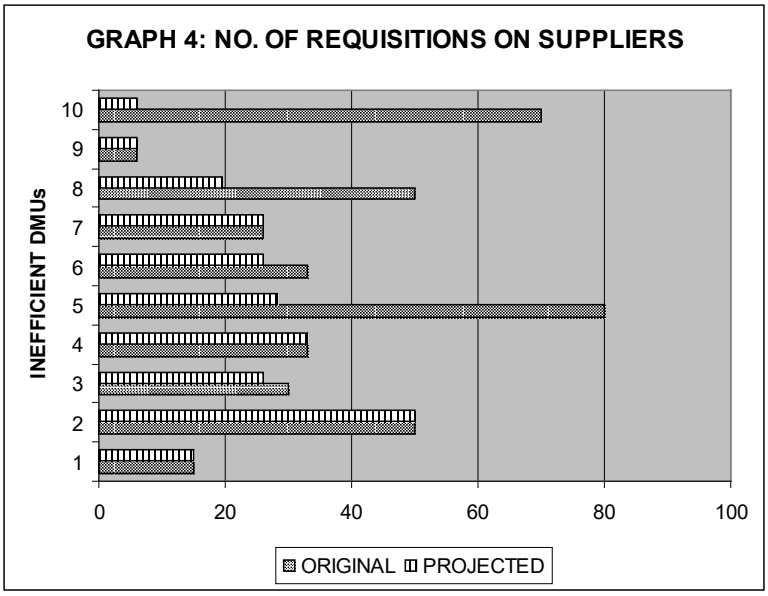
The graph reveals that DMUs 3,5,6,8 and 10 have to increase the number of export orders. On the basis of the analysis, projections for the output factor - number of domestic orders were made for the inefficient DMUs 3, 5, 6, 8 and 10 which has been graphically presented in Graph 3 as below.



The graph reveals that DMUs 3,5,6,8 and 10 have to increase the number of domestic orders.

On the basis of the analysis, projections for the input factor - number of requisitions on suppliers were made for the inefficient DMUs 3, 5, 6, 8 and 10 which has been graphically presented in Graph 4 as below.



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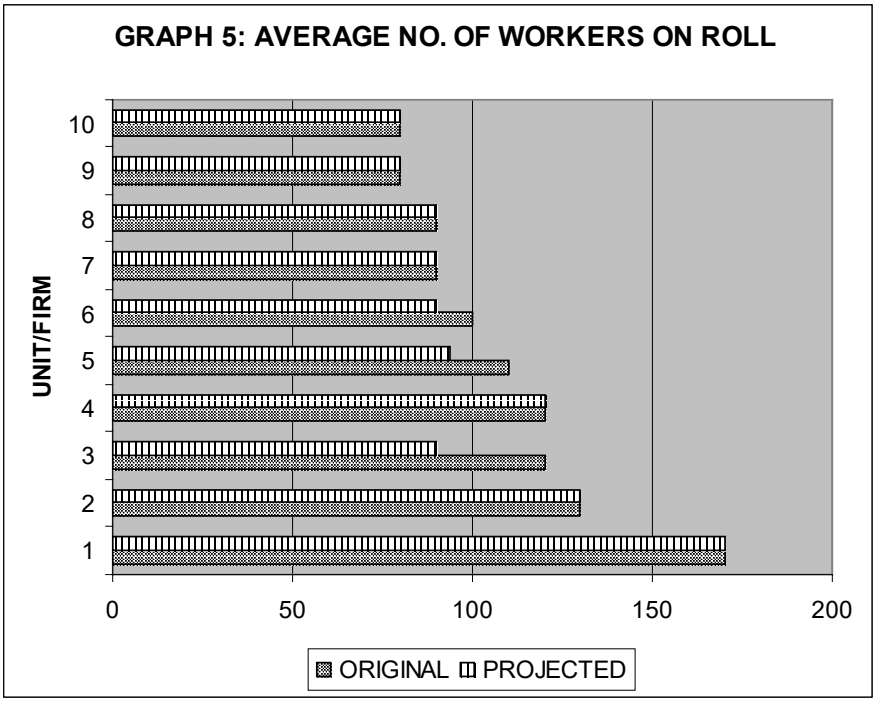
The graph reveals that DMUs 3,5,6,8 and 10 have to decrease the number of requisitions on suppliers. On the basis of the analysis, projections for the input factor - average number of workers on rolls were made for the inefficient DMUs 3, 5, 6, 8 and 10 which has been graphically presented in Graph 5 as below.



The graph reveals that DMUs 3, 5 and 6 have to decrease the average number of workers on roll.

The firms/units (identified as inefficient DMUs) are to redesign their plans and policies to achieve their targets, and upon successful achievement these firms will be able to sustain as well as enhance their performance. It will also help sustain and enhance the performance of the Darjeeling region. It is important to note that it is not a one-time exercise. The whole process should be reviewed and repeated on a regular basis - to aim at continuous enhancement efforts through on-going benchmarking.

Conclusion

The present paper is an extension of benchmarking in the form of a collaborative benchmarking, but can also be considered to be supply chain collaboration. There are certain limitations of DEA - it is deterministic and particularly sensitive to measurement errors. Irrespective of its limitations, the DEA can guide the collaborators to benchmark their as well as their partners' performance. This paper also suggest that the tea gardens, tea distributors and those related can form supply chains and participate in benchmarking exercises towards sustainable performance.