World Academy of Science, Engineering and Technology
International Journal of Industrial and Manufacturing Engineering
Vol:11, No:6, 2017

Benchmarking Role in Internal Supply Chain Management of Indian Manufacturing Industries

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Open Science Index, Industrial and Manufacturing Engineering Vol:11, No:6, 2017 publications.waset.org/10008407.pdf

***Abstract*—**Due to day by day competition in the market, the implementation of benchmarking practice is necessary for improving existing internal supply chain management performance of manufacturing industries. The continuous benchmarking practice might be helpful to increase the productivity of middle scale medium enterprises (MSMEs) by reducing the idle time during the flow of raw material/products, funds and information. The objective of this research paper is to provide an overview of benchmarking, benchmarking wheel, benchmarking tool and techniques and its importance through literature review of reputed journals. This concept of benchmarking may be fruitful in the process of gap identification and for improving the performance of internal supply chain management of Indian manufacturing industries.

***Keywords*—**Benchmarking, benchmarking cyclic wheel, supply chain management, types of benchmarking, supply chain management.

I. Introduction

BENCHMARKING methodology is a primary continuous practice tool for regular improvement of any business. As competitors should provide challenge within market, they also provide insight on how operating costs can be reduced and efficiency would be increased. The objective of benchmarking analysis allows the industries to measure the performance of products or services against its competitors and also select best-in-class industries out of all. A review of benchmarking in manufacturing sector and a discussion of its future potential are carried out particularly at a time when producers have to make significant changes to their business practices for survival. Generally, MSMEs are not using benchmarking of internal supply chain management practice in regular manner [1]. Decision-makers are constantly focused on those latest techniques, which are helpful in quality improvement in internal supply chain management practice. Benchmarking of ISCM is not a new technique; it is a regular practice of internal supply chain performance gap identification. The selection of benchmarking partner is very important. The manufacturing industry can hire benchmarking partners either from outside agencies or from inside the industry. It depends upon the capability of manufacturing industries. A group of benchmarking partners should work continuously for eliminating the gap by reducing the idle time between internal supply chain activities within plant. The objective of this study is to review the available literature of benchmarking in various fields then identify the benchmarking role in improving the internal supply chain management performance of manufacturing industries.

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II. Review of Literature

Benchmarking practices were introduced in American markets during 1970s. This new concept was used by the Xerox Corporation to identify performance gap with its competitors. The competitors of Xerox Corporation were continuously selling their product in fewer prices. However, it was not easy to understand the reason and procedure followed by competitors to sell different types of machines in fewer prices. In order to understand this, benchmarking was used as a tool to analyze some special measures [2].

In 1982, the Xerox Corporation followed benchmarking practice in logistics and distribution activity against its competitor [3]. In 1985, Metro Toronto Reference library in Toronto, Canada used benchmarking practice in public service department [4]. Again during 1990, benchmarking was practiced in business environment for research purpose [5]. Benchmarking practice is a very helpful tool which provides better result while doing comparison between competitors. The American Productivity and Quality Center (APQC) opened its 'International Benchmarking Clearing house' in 1992. According to researchers "benchmarking practice is defined as a continuously comparing performance of manufacturer with its best leaders anywhere in the world and gain valuable information for improving the existing performance of manufacturer" [6].

A. History of Benchmarking

Benchmarking history may be classified in classified in five categories. The first generation was reverse engineering, which was an engineering-based approach for product comparisons that included analysis of technical product characteristics. The second generation was competitive benchmarking. This type included product comparisons with its competitors. The objective of third generation benchmarking is to select the best process on the basis of standards [7]. In fourth and fifth generations, strategic and global benchmarking was introduced in business sector. Benchmarking practice includes the concept of competitor & market analysis, quality improvement programs, performance measurement [8].

Benchmarking is the process of comparing something or someone with best practice. Best practices are collections of

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activities within an organization that are done very well and ultimately they are recognized as such by others. The core of the current benchmarking interpretation is:

- Learning from the benchmarking partners and to introduce for improvements in one's own organization.
- Measurement of own and the benchmarking partner's performance level, both for comparison and for registering improvements.
- Improvements as the ultimate objective of any benchmarking study. Improvements encompass incremental change, major steps and innovations [9].

The number of definitions is available on benchmarking. Benchmarking is a tool for improvement the performance of manufacturing industry. Benchmarking is a continuous process which assists the decision makers/managers of industries in order to identify the performance gap of industries. The systematic literature review of classification and categorization of benchmarking in supply chain management has been carried out in different fields. Benchmarking covers all activities where managers compare their practices and performance with others and make changes intended to result in improvement [10].

Firstly, the purpose of benchmarking is to identify what they need to change in order to improve their performance. Secondly, it works as a model or principle to guide the implementation of practices and also bridge the gap between goals and aspirations. It is difficult enough for people to learn about the benchmarking in internal supply chain management having much more challenges in a complex network of individuals and their industries. The research that forms the basis of this paper uses internal benchmarking in the field of internal supply chain of manufacturing industry. Authors have developed a benchmarking framework for internal supply chain management and implemented it for performing the comparative analysis [11]. In order to promote internal competitions, departmental services are compared for evaluating internal supply chain management benchmarking [12].

B. Sources of Benchmarking Literature

In this research, we have identified lot of literature on benchmarking, benchmarking types, benchmarking process; benchmarking wheel and its importance through different reputed journals of benchmarking and publications. This stage involved the source of relevant data of benchmarking. For the current research topic on benchmarking, the unit of analysis involved different journal articles. The data collection phase of literature review includes various production, economics, benchmarking and supply chain management journals. In this study, authors have come across lot of journals like:

- Benchmarking: An International Journal, Emerald's Journal
- Science Direct Journals
- Journal of Management Information Systems
- Management Science
- Supply Chain Management: An International Journal Emeralds Journal
- IEEE Journals
- Journal of Supply Chain Management
- European Journal of Operational Research
- Inderscience Journals
- European Journal of Information Systems
- Elsevier Journals
- Business Process Management Journal
- Decision Science Letters
- Information Systems Management
- Taylor & Francis Journals
- Total Quality management
- Frontier Mechanical Journal
- Business management
- Springer Journals

III. Research Methodology

In this paper, we used the following methodology:

- Collect details of benchmarking through literature review.
- Identify the needs of benchmarking in the area of internal supply chain management of select Indian manufacturing industries.
- Finally in result section, explain the scope of benchmarking in improving the internal supply chain management performance of Indian manufacturing industries.

IV. Benchmarking Process

Benchmarking practice has the concept of the internal business process as one of its central ingredients. Benchmarking is a continuously comparative performance practice at internal and external levels of business. The conclusion of this benchmarking practice is just to identify gap and reduce them for improvement existing process. For many other manufacturing organizations, competition in smaller areas is necessary for making best outcomes of benchmarking. The regular practice of benchmarking supports the businessmen to distinguish the best standards of working as well as for getting the information about what their competitors are doing and how they are producing best in minimum possible of time [13]. Thus benchmarking is a highly respected proactive management tool which is being increasingly used to identify and focus improvement activities with the goal of international competitiveness.

Benchmarking is a continuous close loop process [14] which starts from planning phase and ends at action phase through do and observation phase [15]. It consists of the following steps: Plan – Do - Observe - Action as shown in Fig. 1.

1st Step- Plan

Planning includes several factors and to overcome these different types of factors, certain steps are followed like – identifying what one wants to benchmark for example: product, process or service etc. [16]. The selection of benchmarking team members are also be decided in planning phase [17].

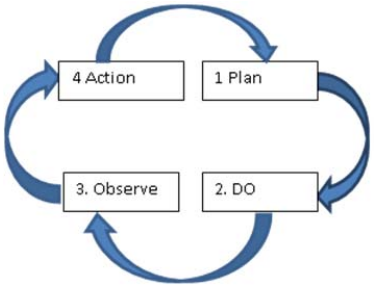

Fig. 1 Benchmarking cyclic process

2nd Step- Do

In this phase, one has to select the benchmarking team members from within the same organization and also outside the organization and then benchmark the existing activities with other best competitors.

3rd Step- Observe

The purpose of observe phase is to check the performance gap between the performance measuring parameters of benchmarking [18].

4th Step- Action

The objective of this step is to implement the appropriate quantitative tools and techniques to overcome the existing performance gap.

A. Benchmarking Barriers

The identified barriers of benchmarking are as follows:

- Not involving the appropriate people (process owners)
- Lack of understanding the internal processes
- Not understanding that learning can happen even without inventing it
- Lack of action
- Failure to see need for change
- Inability to see opportunity to improve
- Weak leadership organization not promoting entrepreneurial behaviors, innovation or risk taking [19].

Globally benchmarking practice is generally used to do the comparative analysis on the basis of standards [20]. The quantitative benchmarking practice is the comparison of existing performance data of manufacturer with the best standard data [21].

B. Benchmarking Misconceptions

Following are the commonly grouped misconceptions for benchmarking.

- Benchmarking leads to explicit cause-effect relationships with best practices.
- Benchmarking leads to rating and ranking of performance
- Participation in benchmarking is revealing trade secrets that would lead to compromising competitive advantage
- It is a reactive tool
- Benchmarking is just copying others
- It is a one-time program

In summary, benchmarking is not simply data comparison practice, but the purpose of benchmarking is to reduce the existing resources of manufacturing organization or optimize them. The aim of benchmarking practice is a continuous regular systematic structural practice for improving the existing performance [22].

C. Existing Benchmarking Models

The objective of existing review of benchmarking models is just to distinguish the benchmarking process steps. After the review of literature on benchmarking for improving internal supply chain management of Indian manufacturing industries, it was found that different models of benchmarking gives different information regarding processing steps of benchmarking. The objective of benchmarking process models is to provide the structure which can help different users for benchmarking routes. The review of benchmarking models is to provide the guidance for easily understandable planning and execution of benchmarking practice. Following models were considered for the present study:

- The Camp Model
- Meta-model developed by International Benchmarking Clearing house
- Baxter Benchmarking Model
- Spendolini's 5-stage Benchmarking Process
- Watson Model
- Leibfried and Me Nair Model
- Benchmarking process Model
- The APQC Model

Each of these models has explained that benchmarking is a continuous process with successive phases being critical to the successful execution of the process [23].

D. Types of Benchmarking

In general there are four types of benchmarking.

- Internal Benchmarking:

Internal benchmarking means comparison of internal operations between different divisions or similar functions in different operating units within an organization.

- Competitive Benchmarking

The purpose of competitive benchmarking is to compare the existing performance of manufacturing industries with its best external competitor.

- Functional Benchmarking

The objective of functional benchmarking is comparing the existing functions of organization with its competitors or best standard in the market, even if the industries themselves are dissimilar.

- Generic Benchmarking

This focuses on the best work processes. Instead of focusing on a company's business practices, similar procedures and functions are benchmarked. Further, one recent categorization has been made from the European Commission initiative that proposes three levels in benchmarking [24]:

- Company
- Sectorial
- Benchmarking of framework conditions.

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E. Benchmarking Importance in ISCM

For learning a benchmarking methodology, internal benchmarking may be a first step of internal supply chain for manufacturing industries. It requires that "specific training and education program pertaining to recruiting and retaining skilled staff must be performed" [25]. SCM is a wide area; its main function is to manage the flow of materials, finance and information between the activities [26]. Supply chain management can be classified into two categories i.e. External supply chain management (ESCM) and internal supply chain management (ISCM). The function of ESCM is to manage the flow of material, funds and information outside the manufacturing industry. But the function of ISCM is to manage the flow of material, funds and information within the manufacturing industry. In the present study, we have analyzed the importance of benchmarking in ISCM. The performance of ISCM may be affected by different variable factors. For this purpose, authors identified some performance measures/factors for benchmarking of ISCM; few factors were mentioned in his previous research paper [27]. In this research work remaining factors are identified through literature review. Table I consists of performance indicators with references. Such types of performance measures may be fruitful in improving ISCM performance of industries and its benchmarking.

TABLE I
PERFORMANCE INDICATORS OF ISCM BENCHMARKING

Serial no.	Performance Indicators	References
1	Operational logistics-Frequent change in production schedules, Production loss due to lack of material, Frequent changes cause high WIP of sub assembly, Reduction in WIP inventory level, Manufacturing lead times, Material handling for WIP from one place to another	[28]-[34]
2	Outbound logistics- Transportation lead-time, Outgoing quality control, Allocation of warehouses to different factories, Distribution strategies, Information flow about current market trends, Finished goods inventory level, Demand forecasting, Inventory level at different warehouses	[35]-[46]
3	Economies of scale- Buffer/safety stock held by user, Cycle stock, Anticipation stock, Pipeline stock	[47]-[59]
4	Flexibility- Customer service flexibility, Order flexibility, Location flexibility, Delivery time flexibility	[60]-[71]
5	Logistics strategies- Supply chain planning, Transportation system planning, Vehicle routing, Warehousing planning, Scheduling planning, New Product development system, Product Performance, Technology & Innovation, Product development cost Reliability of product, Warranty of product, Responsiveness of product, Flexibility of product	[72]-[88]
6	New Product development system- Product Performance, Technology & Innovation, Product development cost, Reliability of product, Warranty of product, Responsiveness of product, Flexibility of product	[89]-[96]
7	Material follow up and Procurement- Order modification ratio, Frequency of urgent material requests from suppliers, % of incoherencies between physical and system record of material, Production with missing parts, Line-stop durations and frequency, Items transported by air, express, cargo, Money spent for transportation by air, cargo charged to suppliers, Performance of early delivery, Performance of late delivery, Time spent for part missing product completions, Number of alternative material usage, Items supplied from alternative suppliers, Indirect labor hour for follow up, No. of items used which are not in BOM	[97]-[104]
8	Production Operation Process- PO decision meeting lead time, Percent deviation PO forecasts from the realized sales, Modification frequency of PO's, Lead time of monthly production plan preparation, Realization of dealer sales target, Correctness of data transfer, Late orders quantity, Make to stock quantity, Flexibility of material handling system	[105]-[114]
9	Production Programming- Coherence b/w realized program & MRP, Frequency of postponed validation Re-treatment quantity & frequency (based on type, period, vehicle), Urgent request fulfillment cycle time, No. of simulations to correct the mistakes, Number of items simulated, % of critical items w.r.t. total items, Production cycle time, Quantity & frequency of scrap orders	[115]-[125]
10	Quality System-Product Quality Planning Process, ISO/TS-16949 system related activities, Process quality control Plan, Process Capability Analysis, Supplier selection and approval, Production Parts, Approval Process (PPAP) Validation, Quality control (incoming/outgoing), Calibration of equipment Field failure analysis, Inspection (incoming, in process, final)	[126]-[133]
11	Products delivery- Delivery cost per component, Number of items returned from dealer, Transport cycle time from invoicing until delivery to dealer, Factory stock (Assembly line output to assignment point), Lead time from point assignment to dealer, Ready-to-deliver stock levels more than 3,6,9,12 months, Performance of transporters (lead time), Damaged items during transportation, Final checking time per item (at assignment point)	[134]-[138]
12	Foreign trade and service management- Packaging mistakes of suppliers, Number of air shipments , % of air shipments charged to supplier, Packaging cost percentage in total cost, Percentage of on-time deliveries, Correct programs sent to suppliers, Cycle time (waiting at warehouse), Stock level for export % of warehouse usage , Undeclared missing parts, Protection fault	[139]-[146]
13	Transport-Reception-Custom decision- Vehicle routing problem description, Model review to address, transportation problems in supply chain, Supply chain integration and IT, Transport costs, Transport lead times and deviations, Extra customs clearance cost, Cycle time of the trucks in the plant, Import material customs clearance lead time, Information system incoherencies, Amount of empty area of full containers, Container/special packaging equipment returning cost	[147]-[162]

V. RESULTS

A. Benchmarking Role in Internal Supply Chain Management of Indian Manufacturing Industries

Today, Indian manufacturing industries continuously affect the economy of country. So it is necessary to take some initiatives in the areas of manufacturing. The performance of manufacturing industry would be improved through the performance of internal supply chain management. The continuously benchmarking practice may affect the performance of internal supply chain management of any manufacturing industry through identification of performance gap. That's why authors have come across critical review of benchmarking practice for improvements of internal supply chain areas of any Indian manufacturing industry [163]. Manufacturing industries should consist of different process of manufacturing like: Machining, Casting, Forging, Welding, Sheet metal work, Assembly and Packaging goods. The main

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purpose of manufacturing process is to convert raw material into final shape of the product. 4M (Men, Material, Machine, and Method) role in any manufacturing industry is very important. The main function of management in Internal Supply Chain is to manage the flow of raw material, funds and information between 4 M (man, machine, material, method) in different departments.

- Man

The main function of man power is to control variation in plant during internal supply chain flow at different work stations. Secondly, man power should estimate that how manufacturing should be done by efficient utilization of internal supply chain and optimum utilization of 4 M resources internal.

- Machines and Equipment

These are the important part of manufacturing industries. The continuous practice of benchmarking of internal supply chain management should provide assistance in identification of loop holes during the material flow between different material handling equipment and machinery within the plant.

- Materials

Quality of raw material may also affect the flow of internal supply chain management. Benchmarking practice should also provide help in selection of better quality materials for manufacturing of different product. Procurement and purchase manager must have knowledge of materials properties. In this way, he can select best quality of material as well as alternative material as per the need of customer demand. Therefore, delay during flow of material at different stages should be reduced.

- Methods

Best method selection is very necessary activity of internal supply chain management. The comparative benchmarking of methods must be used to identify the better and effective method out of available resources and alternative methods.

To fix up the production targets, delivery dates production department considered the minimum production costs and time. The continuous practice of benchmarking are very helpful in improving the performance in multiple areas like banking sector, education sector, retail industries, defense weapons manufacturing industries, service sectors, agriculture sectors, surgical equipment's manufacturing industries, FMCG sectors, etc. Therefore in almost all sectors, benchmarking continuous practice can be implemented for improving the existing process and performance of Internal Supply Chain Management.

VI. Conclusion

This research study provides information towards review of benchmarking tools and techniques for improving the internal supply chain performance of select Indian manufacturing industries. In spite of the number of publications with several aspects of benchmarking like benchmarking history, benchmarking wheel cyclic process with steps (see Fig. 1), benchmarking barriers and misconceptions, review of benchmarking models and types of benchmarking. The conclusion of this paper is that benchmarking is a continuous practice process which may be used to find out the performance gaps between the existing internal supply chain management processes. Authors conclude that benchmarking is a continuous practice tool which may be implemented in multidisciplinary areas to overcome the existing gap. In view of that not much work is to be carried out in the field of benchmarking in internal supply chain management.

- Future Scope

The present literature on benchmarking and internal supply chain management are inadequate to understand the industrial need and thus they offer scope for further research and exploration in the area of benchmarking for internal supply chain management.

- Limitation of Work

This paper has explained only about benchmarking and its importance for improving the performance of ISCM of selected Indian manufacturing industries. In this research paper, authors have enlisted some performance measurement indicators using literature review.

Acknowledgment

The authors are extremely thankful to the journal Editor-in-Chief and anonymous reviewers for their constructive suggestions that helped to improve the literal and technical content of the paper.

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