

Application of Information Technology enabled tools in Supply Chain Management Practices of Manufacturing Industries

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Abstract:

Manufacturing has been the back bone of Indian economy in the past decade, and it contributes 16 percent to the gross domestic product. Government of India has initiated the “Make in India” campaign to give a boost to the manufacturing sector. The growth rate in manufacturing sector has not been at par with the planned level. The necessity of developing small scale industries have been noticed since post independence period and from there, the focus of every government that came into existence have been in the creation of more space for small scale manufacturers in the country.

Keywords:Information technology,Manufacturing,Supply Chain Management

1. Introduction:

Supply Chain Management is a business philosophy, a strategy for gaining a competitive advantage by coordinating all processes, beginning with the sourcing of raw materials from Mother Earth and ending with the final product delivered to the consumer, and the efficient management of the information systems required to monitor all of these activities.It streamlines all partners, including intra- and inter-organizational members such as suppliers, manufacturers, distributors, wholesalers, retailers, third-party logistics providers, and service providers. SCM is no longer seen as a support function, but rather as one of the essential functions that will undoubtedly provide the business with a competitive advantage in the market.In recent years, the manufacturing or production industry in developing nations (MIDC) has faced unpredictability and pressure from the global business trend. To adapt, the manufacturing industries are doing everything they can to improve operations using various manufacturing strategies such as Pokayoke, Total Quality Management, Lean Manufacturing, Business Process Reengineering,

and others. Supply chain integration thus becomes a critical factor for business success. The supply chain members among themselves integrate to support the changing business environments. Companies are now not running against companies, but the supply chain strategies of each company are competing among themselves to increase efficiency. However the manufacturing firms with large scale production (process manufacturing) have still not been able to adapt the systems completely as technology implementation is not easy. Those who have taken risk factor and implemented the information technology enabled tools in their systems, are contributing more to the market shares. The outcomes of globalization has induced more fierce competition and forced the firms to focus on depending the supply chain practices, rather than on effectiveness and efficiency of separate business functions internally. Information technology (IT) is a critical tool for effective and efficient supply chain integration and many of these applications have recently gained popularity because of their prompt action and effectiveness. This is due to their ability to facilitate, corporate, coordinate and integrate the flow of information among the supply chain members to 4 establish a great deal of relationship for better performance. Some of the critical IT developments that gained popularity are, Electronic Data Interchange (EDI), ERP (Enterprise Resource Planning), and Radio Frequency Identification (RFID) and Internet applications. Many researchers have explored that IT has an essential role in business survival and it improves the firm's competitive advantage and increase the operational efficiency and flexibility of the firm. The numerous advantages gained from the successful use of IT-enabled technologies will provide advantages in both concrete and intangible ways. The selection of appropriate IT-enabled solutions, as well as the costs associated with their implementation, remain difficult jobs. Nonetheless, the industrial industry in developing countries must adopt adequate IT tools to capitalise on their competitive advantage. The effective use of IT tools will provide the MIDC with a superior alternative in their global supply chain integration initiatives, where supply and demand decisions are fully supported by facts.

2. Objectives:

- i. To study the association between levels of awareness of IT enabled tools in SCM practices in Cost reduction and CRM.
- ii. To study the association between Effectiveness in cost reduction and effectiveness in CRM.

3. Problem Statement:

Nowadays, businesses are commonly viewed as components of multi-company, multi-echelon networks, i.e., supply chains that deliver goods and services to the final client. Although the importance of IT in achieving effective SCM is well acknowledged, empirical research on how IT is utilised to achieve these goals in practise is sparse. Specifically, previous research has either modelled the benefits of inter-organizational information technology and information exchange or measured the impact of certain technologies on supply chain efficiency. However, the true uses of IT in SCM, as well as the motivations for deploying IT in a specific manner, are unknown.

4. Literature review:

According to Hishan S. Sanil et al. (2016), one of the important strategic components of corporate organisations is the management of SCs. Some of the primary activities covered by SCM include controlling the company's production of goods and services, monitoring inventory, contacting suppliers, and assuring timely distribution of commodities. The expansion of SCM in the Indian business sector will probably certainly improve its connection to the global market.

According to Kamble S, et al. (2015), the supply chain is critical in organising, planning, and executing enterprise processes. It also contributes significantly to the company's operating efficiency. Numerous variables, such as items, client satisfaction, and overall business expansion, require successful execution.

According to Bernd Noche et al. (2013), the only techniques of establishing new market trends and leveraging market potentials are innovative strategies and innovative supply chains. This can only be accomplished by integrating supply chain tools with information technology support.

According to Dashputre, Bakre, and colleagues (2012), suppliers, manufacturers, distributors, and resellers must collaborate efficiently to improve sales, reduce costs, and maximise resource utilisation. This is accomplished by ensuring continuous information flow throughout the product's life cycle and by decreasing data redundancy at each step. Not only should the different phases be closely integrated, but the individual steps in the chain should also have more automation and simple access to the related information.

5. Research Methodology:

Population

The research is confined to Maharashtra State. The total number of manufacturing firms registered under the government of Maharashtra has been taken as the total population for the study. Effectiveness in SCM practices. Awareness of IT enabled tools in SCM Practices Effectiveness in Cost reduction through application of IT enabled tools in SCM practices Effectiveness in CRM through application of IT enabled tools in SCM practices 12 A total number of 3532 small scale manufacturing companies are present together with 54 medium scale manufacturing units and 37 large scale manufacturing units in Maharashtra State. The data of registered industrial units in Maharashtra available with the Department of Industry and Commerce in Maharashtra government and the Maharashtra State Industrial Development Corporation were considered and the total number of such units was defined as the population for the present study.

Primary Data

Here, the primary data is obtained through a structured questionnaire. The respondents were the departmental personnel who are in charge of the supply chain and logistical activities of the companies. Senior level staffs and junior level staffs were interviewed personally and their opinions and comments were also taken in record.

Secondary Data

Secondary data were gathered from journals, papers, and other related sources available on paper and on the internet. Prior to the research, an exhaustive literature review was conducted, and a clear conceptual literature was produced. Based on this extensive literature review, the methodology of research and the variables were identified.

Sampling Technique

The current study employed stratified random sampling. The overall population is divided into three strata based on the extent of government investment in plant and machinery.

Hypothesis

H0:Regarding elements relating to the use of IT in SCM practises of manufacturing, the nature of the product does not significantly differ from other factors.

H1:Regarding elements relating to the use of IT in SCM practises of manufacturing, the nature of the product significantly differ from other factors.

H0:Regarding the use of IT in SCM practises in Maharashtra's manufacturing industries, there are no appreciable differences in industry scale.

H1:Regarding the use of IT in SCM practises in Maharashtra's manufacturing industries, there are appreciable differences in industry scale.

Limitations:

I. The entire research was time consuming as it was spread all over Maharashtra State. The geographical expansion of research was very hard because the location of the industries were uneven.

II. Only the people responsible for supply chain and logistics activities were interviewed as the subject breadth was so large and discussion with other officials was not easy.

III. Response from government and cooperative sector firms were difficult due to the policies and regulations prevailing in that sector.

IV. However the research was unaffected by all these peripheral factors and was able to meet the objectives of the study

6. Data Interpretation:

Table of Mean and Standard Deviation of Factors in Customer Data

Factors	Mean	SD
Ease in data access and retrieval	3.497	1.306
Accurate order processing	3.517	1.343
Service reports made available to proper authority at regular intervals without fail	3.419	1.305
Lot sizing and order batching without bias	3.511	1.297
Shipment consolidation done as per the data input without delay	3.531	1.266

Interpretation:

When IT enabled tools are used in supply chain management, the highest customer relationship management practise is shipment consolidation done as per the data input without delay (3.531), followed by correct order processing (3.517), and so on. The least CRM activity is for Service reports made available to proper authority at regular intervals without fail (3.419). This indicates that through Information Technology, the arranging of data as per the input is done without any delay and through technology only this is achieved. Order processing has always been a headache to the supply chain practitioners as the prioritization as per demand was hard.

Table of Mean and Standard Deviation of Factors in Service Orientation

Factors	Mean	SD
Easy service improvement	3.706	1.294
Process integration made more successful through technology sharing and information gathering	3.722	1.306
Collaborative solutions through MIS management	3.642	1.291
Routing delay eliminated through calculations using soft-wares	3.683	1.293
Common systems adapted as a result of information sharing	4.483	0.716

Interpretation:

The highest mean value for the CRM factor with regard to service orientation is for Common systems adapted as a result of information sharing (4.483), followed by process integration made more successful through technology sharing and information gathering (3.722). The least CRM factor is for Collaborative solutions through MIS management (3.642). It is understood from the analysis that information sharing makes the entire supply chain work on a same platform bringing out generality in the process of communication. This in turn reflects in flawless working of the system.

7. Hypothesis Testing & Results

Null Hypothesis: H_0 - Regarding elements relating to the use of IT in SCM practises of manufacturing, the nature of the product does not significantly differ from other factors.

Table of Bulk and Discrete Nature of Products

Awareness, Cost reduction and CRM factors	Nature of product				t value	p value
	Bulk		Discrete			
	Mean	SD	Mean	SD		
Data warehousing	32.65	5.24	30.72	6.04	3.258	0.001**
Logistics decision	21.01	2.99	19.75	4.05	3.383	0.001**
Facilities	20.28	3.16	19.15	4.05	2.993	0.003**
Operations	20.65	2.95	19.72	3.45	2.763	0.006**
Sourcing	21.18	2.67	20.66	2.78	1.815	0.070
Pricing	20.77	3.22	20.57	3.30	.573	0.567
Cross Functional Aspects	21.72	2.68	21.26	3.05	1.515	0.131
Overall Awareness about IT Enabled Tools in SCM Practices	158.26	17.97	151.82	21.06	3.131	0.002**
Information costs	20.92	3.38	19.65	4.53	3.046	0.002**
Purchasing costs	21.98	2.19	21.47	2.76	1.917	0.056
Logistics Costs	21.56	2.46	21.26	2.85	1.070	0.285
Operations Costs	18.61	5.91	17.10	6.28	2.346	0.020*
Quality costs	21.70	2.41	21.46	2.71	.872	0.384
Overall Effectiveness of IT Enabled Tools in Cost Reduction	104.76	12.25	100.94	14.16	2.741	0.006**
Customer data	18.12	5.87	16.65	6.11	2.329	0.020*

Feedback	20.97	2.89	20.87	3.00	.310	0.757
Goals Achievement	20.60	3.28	19.53	4.14	2.747	0.006**
Service Orientation	19.84	4.49	18.46	5.53	2.612	0.009**
Competitive Advantage	21.71	2.51	21.71	2.94	.014	0.989
Overall Effectiveness of IT Enabled Tools in CRM	101.25	14.58	97.22	16.45	2.461	0.014*
Overall Effectiveness in SCM Practices	20.43	4.68	19.50	5.37	1.745	0.082

Since p value is less than 0.01, null hypothesis is rejected at 1 percent level with regard to dimensions of Data warehousing, Logistics decision, Facilities, Operations, Overall Awareness about IT Enabled Tools in SCM Practices, Information costs, Overall Effectiveness of IT Enabled Tools in Cost Reduction, Goals achievement and Service orientation. Since p value is

less than 0.05, null hypothesis is rejected at 5 percent level with regard to Operations Costs, Customer data and Overall Effectiveness of IT Enabled Tools in CRM. Hence there is significant influence on Data warehousing, Logistics decision, Facilities, Operations, Overall Awareness about IT Enabled Tools in SCM Practices, Information costs, Overall Effectiveness of IT Enabled Tools in Cost Reduction, Goals achievement, Service orientation Operations Costs, Customer data and Overall Effectiveness of IT Enabled Tools in CRM on Nature of product.

Null Hypothesis: H_0 - Regarding the use of IT in SCM practises in Maharashtra's manufacturing industries, there are no appreciable differences in industry scale

Table of Industry Scale With Respect to factors relating to application of IT in SCM practices of Manufacturing

Awareness, Cost reduction and CRM factors	Industry Scale			F Value	p Value
	Small	Medium	Large		
Data warehousing	31.87 (5.63)	29.80 (5.98)	33.13 (5.53)	2.738	0.066
Logistics decision	0.49 ^{ab} (3.54)	19.00 ^a (4.03)	21.60 ^b (2.59)	4.172	0.016*
Facilities	9.74 ^{ab} (3.71)	18.83 ^a (3.42)	21.17 ^b (2.29)	3.294	0.038*
Operations	0.21 ^{ab} (3.24)	19.27 ^a (3.45)	21.50 ^b (2.16)	3.762	0.024*
Sourcing	0.92 ^{ab} (2.69)	19.60 ^a (3.34)	22.67 ^b (1.27)	10.091	0.000**
Pricing	0.61 ^{ab} (3.32)	19.63 ^a (3.13)	22.43 ^b (1.76)	6.170	0.002**
Cross Functional Aspects	1.57 ^{ab} (2.79)	19.70 ^a (3.70)	22.83 ^b (1.23)	9.779	0.000**

Overall Awareness about IT Enabled Tools in SCM Practices	55.40^{ab} (19.43)	145.83^a (24.13)	65.33^b (9.76)	7.684	0.001**
Information costs	0.27 ^{ab} (4.01)	18.83 ^a (4.19)	22.80 ^b (1.90)	8.284	0.000**
Purchasing costs	1.68 ^{ab} (2.48)	21.33 ^a (3.00)	22.97 ^b (1.22)	4.282	0.015*
Logistics Costs	21.39 (2.73)	20.87 (2.42)	22.40 (1.40)	2.778	0.064
Operations Costs	17.81 (6.06)	17.23 (7.06)	20.10 (5.34)	2.161	0.117
Quality costs	21.60 (2.52)	20.37 (3.24)	22.77 (1.28)	6.876	0.001
Overall Effectiveness of IT Enabled Tools in Cost Reduction	02.74^{ab} (13.45)	98.63^a (14.02)	11.03^b (4.72)	7.465	0.001**
Customer data	17.38 (6.04)	16.60 (6.49)	19.33 (4.94)	1.798	0.167
Feedback	1.01 ^{ab} (2.82)	19.10 ^a (4.11)	21.93 ^b (1.82)	7.975	0.000**
Goals Achievement	0.18 ^{ab} (3.70)	18.10 ^a (4.44)	21.60 ^b (1.79)	7.095	0.001**
Service Orientation	9.17 ^{ab} (5.07)	17.63 ^a (4.93)	21.47 ^b (3.68)	4.618	0.010*
Competitive Advantage	1.78 ^{ab} (2.57)	20.00 ^a (4.08)	22.70 ^b (1.26)	8.454	0.000**
Overall Effectiveness of IT Enabled Tools in CRM	99.53^{ab} (15.45)	91.43^a (18.79)	07.03^b (6.97)	7.859	0.000**
Overall Effectiveness in SCM Practices	0.01^{ab} (5.01)	17.20^a (5.75)	22.93^b (1.23)	10.344	0.000**

Since p value is less than 0.01, null hypothesis is rejected at 1 percent level with regard to Sourcing, Pricing, Cross Functional Aspects, Overall Awareness about IT Enabled Tools in SCM Practices, Information costs, Overall Effectiveness of IT Enabled Tools in Cost Reduction, Feedback, Goals achievement, Competitive advantage, Overall Effectiveness of IT Enabled Tools in CRM and Overall Effectiveness in SCM Practices, there is significant difference between Industry Scale with regards to Sourcing, Pricing, Cross Functional Aspects, Overall Awareness about IT Enabled Tools in SCM Practices, Information costs, Overall Effectiveness of IT Enabled Tools in Cost Reduction, Feedback, Goals achievement, Competitive advantage, Overall Effectiveness of IT Enabled Tools in CRM and Overall Effectiveness in SCM Practices. Based on Duncan Multiple Range Test (DMRT) Small scale industry, Medium scale industry and Large scale industry significantly differ with 5 percent level in Sourcing, Cross Functional Aspects, Overall Awareness about IT Enabled Tools in SCM Practices, Overall Effectiveness of IT Enabled Tools in CRM and Overall Effectiveness in SCM Practices. Small scale industry and Medium scale industry significantly differ with large scale industry at 5 percent level in Pricing, Information costs and Overall Effectiveness of IT Enabled Tools in Cost Reduction, but there is no significant difference between Small scale industry and Medium scale industry in Pricing, Information costs and Overall Effectiveness of IT Enabled Tools in Cost Reduction. Small scale industry and large scale industry significantly differ with Medium scale industry at 5 percent level in Feedback, Goals achievement and Competitive advantage, but there is no significant difference between Small scale industry and large scale industry in Feedback, Goals achievement and Competitive advantage. Since p value is less than 0.05, null hypothesis is rejected at 5 percent level with regard to Logistics decision, Facilities, Operations, Purchasing costs and Service orientation. Hence there is significant difference between Industry Scale with regards to Logistics decision, Operations, Purchasing costs and Service orientation. Based on Duncan Multiple Range Test (DMRT) Small scale industry significantly differs with Medium scale industry and large scale industry at 5 percent level in Logistics decision and Facilities. Small scale industry and Medium scale industry significantly differ with large scale industry at 5 percent level in Purchasing costs and Service orientation, but there is no significant difference between Small scale industry and Medium scale industry in Purchasing costs and Service orientation.

Because the p value is greater than 0.05 and there is no significant difference between the Industry Scale for Data warehousing, Logistics Costs, Operations Costs, Quality costs, and Customer data, the null hypothesis is accepted for Data warehousing, Logistics Costs, Operations Costs, Quality costs, and Customer data.

8. Conclusion:

The emerging technologies are providing several opportunities for planning and executing appropriate SCM systems to maintain the proper balance between expense and profit. SCM has become the most important part of any manufacturing organization in this information age. This information age have developed technologies and information resources in such a way that knowledge workers fill the front and top rows of any management. This indeed is one major factor which has to be looked into. Data Warehousing has shown that the companies should be pro active and should be reactive to the volatile markets in current scenario. This has become the brain of business nowadays. The researches for new paths have lead the way to developments in subjects such as Business Intelligence and from there the most modern development named as Business Analytics. Business reengineering is no longer based on the response to the query "What happened?" provided by Business Intelligence, but rather on Business Analytics, which answers the question "Why did it happen?" Maharashtra, although being a small state with a lot of potential, is still a developing state in the manufacturing sector. The total number of large scale and medium scale companies in the state is counted within hundred. Information technology enabled tools have developed as a set of tools, techniques, methods or concepts and methodologies to make improvisations in managerial decision making and fact based analysis. With the development of these IT enabled tools, the manufacturing sector has emerged to a new level. Internationally, by finding the reasons of failure and fact based analysis provides them with a clear cut image of what went wrong and where they have to improvise. Supply chain management had its elevation from all other streams in this scenario as manufacturers identified that implementation of IT enabled tools can increase the strength of their organization. This is possible with the help of extensive data mining, predictive modeling, business process reengineering, visual mapping, quantitative methods etc. The entire study revolves around manufacturing sector and it has found that technological advancement is an inevitable factor in development and growth of any manufacturing firm. Global firms are now making world class

manufacturing as their standard procedures and re engineering is done even at the most bottom level as per necessity. IT enabled tools can give a proper functioning and increased efficiency to SCM practices of manufacturers.

9. Scope for further research

This study takes pleasure in being the first of its type in the state of Maharashtra. As a result, the study serves as the foundation for any future research in this field. In comparison to the RC (Ram - Chandrachoodan) Model of SCM Effectiveness, research enthusiasts can build new methodologies. This study shows all SCM practitioners how to examine the deployment of IT-enabled tools in SCM practises in manufacturing businesses and how it may be turned into a fruitful study for the future. Future research can be centred on forthcoming SCM practises and the use of IT-enabled tools in such practises, which adds value to the entire Supply chain.

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