A STUDY ON IMPROVEMENT ACTIVITIES FOR INDIAN MANUFACTURING INDUSTRIES

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Abstract

This paper presents findings of an extensive survey of Indian manufacturing industries. The survey encompassed three sectors: Four Wheeler Automobile Industries, Two Wheeler Automobile Industries and General Manufacturing Industries. Various Improvement Activities such as Advance Manufacturing Technology, Integrated Information System and Advance Management System have been identified and assessed the degree of investment in Improvement Activities in Indian manufacturing environment. Their sub classifications are also made. Sector wise comparisons of these Improvement Activities are provided. Correlation is also made between the various Improvement Activities. Our results showed that most of the Indian industries are still emphasizing Advanced Management Systems. Four Wheeler Automobile Industries and General Manufacturing Industries are emphasizing on Total Quality Management. However Two Wheeler Automobile Industries are investing more on Activity Based Costing. But, in overall sector it is observed from data analysis that all sectors are emphasizing on Total Quality Management.

Key words: *Improvement activities, Advance Manufacturing Technology, Integrated Information System, Advance Management System.*

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1. INTRODUCTION

Indian manufacturing industries are under increasingly diverse and mounting pressures due to more sophisticated markets, changing the customer choice and global competition. The markets for products are becoming increasingly international. In such a competitive scenario industries have to search for new processes, new vendors, new materials, new shop floor design, and new channels to produce their products and services at very competitive price. Indian industries are no exception to this. Indian industries have quite often followed an opportunistic approach to growth. Indian manufacturing are paying very little attention to improvement activities in the last few decades. This was reflected in poor quality of products, lack of awareness about competitiveness, and most importantly no integration of various business functions such as marketing/sales and production. The manufacturing environment in India was traditionally identified by its regulative and protective characteristics. Till 1990, the Indian economy was protected and inward-looking from global competition. In the absence of competition, industries did not develop the technological capability needed for penetrating the global market. The short-term orientation was due to high cost of capital, frequent government policy changes, and highly protective environment. The eradication of license system in 1991 meant the end of old regime of protection and control.

Today, Indian industries are facing a very different competitive scenario as compared to the past. They are facing competition from imports and from MNCs in the domestic markets. Several industries also have to compete as new entrants in global markets. Earlier, industries would segregate these two markets and serve them with different quality products and services, while perhaps compromising on quality in the home market. Therefore, many strategies that may have worked in the past are not likely to succeed in the future. The new competition is in terms of improved quality, reduced cost, products with higher performance, better service, and a wider range of products all delivered simultaneously.

2. LITERATURE REVIEW

The purpose of literature review is to provide background information on the issues to be considered in this paper and to emphasize the relevance of the present paper. In the present paper the literature review is more concerned in Indian context. Sambasivarao, K.V. et. al. [7], They have discussed various strategic issues, such as finance position, technology position, market position, product conception and resources, and developed a four-stage framework for implementing FMSs. Suresh Kotha et. al. [8], They investigated the complex relationships among strategy, advanced manufacturing technology AMT and performance using survey responses. G.S. Dangayacha et. al. [1], They gave the extensive survey of Indian manufacturing companies. The survey encompassed four sectors: Automobile, Electronics, Machinery, and Process Industry. Various improvement activities have been identified and assessed in Indian context. Sector wise comparison of improvement activities is provided. Manufacturing competence index is also computed for each sector. Lakshman S. Thakur et. al. [4], They explored the issues of

measurement and comparison of the current state of advanced manufacturing technology (AMT) adopted in Indian manufacturing industries, including important information technology (IT) factors. G. S. Sureshchandar et. al. [2], They stated that manufacturing landscape of the corporate world has undergone a quality revolution, resulting in a plethora of research works on the tools, techniques, critical dimensions and other organizational requirements for the effective implementation of total quality management (TQM). Mahender Singh, et. al. [5], they have presented some findings of Indian manufacturing sectors viz. automobile (especially two-wheeler), tractor and general manufacturing industry. Various improvement activities have been identified and assessed in Indian context. Sector wise comparison of improvement activities was provided. They also observed that Indian companies are investing more in AMS as compared to IIS and AMT.

3 IMPROVEMENT ACTIVITIES

Based on literature review identified three broad improvement activities. These are Advanced Manufacturing Technology (AMT), Integrated Information Systems (IIS) and Advanced Management Systems (AMS). These further can be classified into 26 important improvement activities which are common in various research papers.

3.1. Advanced Manufacturing Technology

AMTs are defined as technologies concerned with the application of mechanical, electronic systems, and computer-based systems to operate and control production. It consist a range of programmable machinery that executes, monitor, and connect the production process. Advance Manufacturing Technology has eleven dimensions

- Computer Aided Design (CAD)
- Computer aided engineering(CAE)
- Computer aided process planning (CAPP)
- Computer numerical control (CNC) machines
- Direct numerical control (DNC)
- Robotics (RO)
- Group technology (GT)
- Flexible manufacturing system (FMS)
- Automated material handling systems (AMHS)
- Automated guided vehicles (AGVs)
- Bar coding (BC)

3.2. Integrated Information Systems (IIS)

Integrated information system (IIS) integrates the various business functions through information systems. Integrated Information systems have four dimensions

- Material requirement planning (MRP)
- Manufacturing resource planning (MRPII)
- Enterprise resource planning (ERP)
- Activity based costing (ABC)

3.3. Advanced Management Systems (AMS)

Advance management systems are soft technologies used for simplification of processes. Advance management systems are having the eleven dimensions.

- Customer relations (CR)
- Total quality management (TQM)
- Recycling (RC)
- Business process reengineering (BPR)
- Statistical process control (SPC)
- Just-in-time manufacturing (JIT)
- Benchmarking (BM)
- Workforce involvement (WI)
- Employee empowerment (EE)
- Management training (MT)

4. RESEARCH METHODOLOGY

Research methodology is based on empirical data collected through a questionnaire survey. The survey methodology is used for study. The main objective of survey is observing the status of improvement activities of Indian manufacturing industries. The problem was selected on the gap identified in literature. The questionnaire was administered in 80 industries in the northern region of India. The databases of 80 manufacturing industries located in northern part of India have been extracted industries directories. This is having name of the company, their location and postal address. The companies in which number of employee are more than 100, are included in survey. In Indian scenario, major manufacturing industries are Automobile (Two Wheeler and Four Wheeler) and General Manufacturing Industries.

4.1 Development of Questionnaire

Based on literature (T. Laosirihongthong, 2005 and G.S. Dangayach, 2005) a questionnaire was designed in Indian context. The questionnaire has been developed on a five point Likert scale. The improvement activities such as Advance Manufacturing Technology, Integrated Information System and Advance Management System have been incorporated relevant to Indian context. Questionnaire is related to company profile, number of employee, degree of importance given by company to the improvement activities and degree of investment in different type of improvement activities.

4.2 Profile of Respondents

After the phone calls, email and remainder, out of 80 sending questionnaire, 26 filled responses have been received from the industries, which gives response rate 32.5%. Out of 26 respondents, 12(45.45%) were from quality control department manager. Seven (26.92%) were factory/plant manager. seven (26.92%) were general manager.

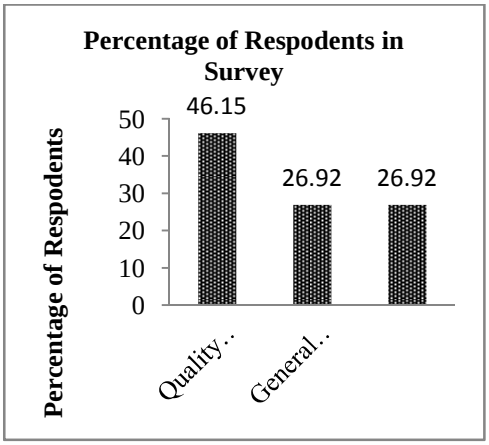

Figure 1 Percentage of various respondents during the survey.

5. OBSERVATIONS AND DATA ANALYSIS OF COLLECTED DATA

The responses of various manufacturing industries (such as two wheeler, four wheeler and general manufacturing industries) are collected through questionnaire survey. The data has been analyzed by SPSS software. The quantitative tools are used for the analysis of collected data in the present work. Quantitative tools include descriptive statistic, reliability analysis, and correlation analysis.

Table 1 Overall mean score value for Improvement Activities.

Improvement Activities	Mean	Std. Deviation
AMT	2.98	.85
IIS	3.37	.93
AMS	3.75	.94

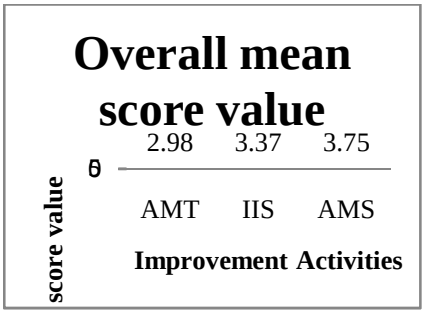

Figure 2 Overall mean score value of Improvement Activities.

Table 1 shows the sector wise statistic mean score value and standard deviation of all three Improvement Activities. Sector wise statistic means score value is graphically represented in figure 2 of all three Improvement Activities. Advance Manufacturing Technology has statistical mean score value is 2.98, Integrated Information System has statistical mean score value is 3.37 and Advance Management System has statistical mean score value is 3.75. This indicates that Advance Management System has highest statistic mean score and Advance Manufacturing Technology having the lowest value statistic mean score value. This means that Indian manufacturing industries are investing more on Advance Management system and investing less on Advance Manufacturing Technology is the least preferred for the investment on Improvement Activities.

Table 2 shows the mean score value of different sector. From the table 2 Advance Manufacturing Technology having the highest mean score value 3.63 for two wheeler automobile industries and Advance Manufacturing Technology having the lowest mean score value 2.22 for General Manufacturing Industries. This indicates that two wheeler automobile industries are investing more Advance Manufacturing Technology. Two Wheeler Automobile Industries are giving more emphasizing to Advance Manufacturing technology. General Manufacturing Industries are investing less on Advance Manufacturing Technology. The Two Wheeler Automobile Industries have highest mean score value 4.12 in case of Integrated Information System. Integrated Information System has lowest mean score value 2.37 for General Manufacturing Industries. This indicates that Two Wheeler Automobile industries are also investing more on Integrated Information System. General manufacturing Industries are investing less on Integrated Information System. Two Wheeler Automobile Industries are integrating their process. Four Wheeler Automobile Industries are having the highest mean score value 3.96 in case Advance Management System. General manufacturing Industries are having the lowest mean score value 3.18 for Advance Management System. This indicates that Four Wheeler Automobile Industries are investing more on Advance Management System. General Manufacturing Industries are investing less on Advance Management System. Four wheeler industries are simplifying their process with the help AMS. But overall figure 3 indicate that Four Wheeler gives importance to Advance Management System having mean score value 3.96. Two Wheeler Automobile Industries give importance to Integrated

Table 2 Mean Value of Sector Wise Improvement Activities

IMPROVEMENT ACTIVITIES	Four Wheeler MEANSD		Two Wheeler MEANSD		GENERAL MEANSD		OVERALL MEANSD	
AMT	3.69(2)	1.60	**4.16(1)**	.75	2.25(5)	1.48	3.25(3)	1.55
CAD	3.15(5)	1.72	3.83(4)	1.16	1.87(9)	1.64	2.92(7)	1.59
CAE	3.23(4)	1.58	3.66(5)	1.03	1.75(10)	1.48	2.96(6)	1.55
CAPP	3.46(3)	1.50	3.50(9)	.83	2.75(2)	1.66	3.33(2)	1.46
CNC	2.92(7)	1.55	3.66(6)	1.03	1.62(11)	1.18	2.81(9)	1.56
DNC	2.23(11)	1.53	**4.16(2)**	1.60	2.25(6)	1.48	2.85(8)	1.63
RO	2.92(8)	1.25	4.00(3)	.89	2.00(8)	.75	3.00(4)	1.24
GT	**3.76(1)**	.83	3.66(7)	1.21	**2.87(1)**	1.24	**3.44(1)**	1.12
FMS	2.69(9)	1.43	3.66(8)	1.36	2.50(3)	1.60	2.70(10)	1.40
AMHS	2.38(10)	1.60	2.33(11)	1.21	2.25(7)	1.28	2.55(11)	1.47
AGV	3.15(6)	1.72	3.33(10)	.81	2.37(4)	1.06	3.00(5)	1.46
BC	3.05	1.48	3.63	1.08	2.22	1.35	2.98	1.46
Sector statistics								
IIS	**4.46(1)**	.87	4.16(2)	1.16	**2.62(1)**	1.68	**3.66(1)**	1.41
MRP	3.69(3)	1.31	4.16(3)	.75	2.25(2)	1.03	3.33(3)	1.33
MRP II	4.00(2)	1.22	3.83(4)	1.32	2.50(3)	1.41	3.37(2)	1.47
ERP	3.38(4)	1.26	**4.33(1)**	.51	2.12(4)	.99	3.14(4)	1.37
ABC	3.88	1.16	4.12	.94	2.37	1.28	3.37	1.39
Sector statistics								
AMS	4.07(5)	.86	3.83(6)	.75	3.62(5)	1.76	3.85(6)	1.32
OA	4.23(2)	1.09	4.00(3)	.63	3.62(6)	1.68	3.96(4)	1.25
CR	**4.53(1)**	.66	4.00(4)	1.26	**3.87(1)**	1.80	**4.37(1)**	1.11
TQM	3.46(11)	.96	3.50(10)	.83	2.25(10)	1.48	3.07(11)	1.20
RC	3.53(10)	1.19	3.83(7)	.75	2.00(11)	1.06	3.18(10)	1.35
BPR	4.00(6)	.70	3.50(11)	1.51	2.37(9)	.91	3.33(9)	1.17
SPC	3.61(9)	1.19	4.16(2)	.40	2.87(7)	1.55	3.55(8)	1.28
JIT	3.92(7)	1.03	4.00(5)	.63	2.87(8)	1.64	3.77(7)	1.25
BM	3.84(8)	.89	3.83(8)	.75	**3.87(2)**	.99	3.96(5)	.85
WI	4.15(4)	.80	3.83(9)	.98	3.75(4)	1.38	4.07(3)	.99
EE	4.23(3)	.72	**4.33(1)**	.81	**3.87(3)**	.83	4.14(2)	.86
MT	3.96	.92	3.89	.84	3.18	1.37	3.75	1.15
Sector statistics								

Table 3 Most Preferred Sector Wise Improvement Activities

Rank	**Four wheeler automobile industries**	**Two wheeler automobile industries**	**General manufacturing industries**	**Overall manufacturing industries**
1	Total quality management (AMS)	Activities based costing (IIS)	Total quality management (AMS)	Total quality management (AMS)
2	Material requirement planning (IIS)	Management training (AMS)	Workforce involvement (AMS)	Management training (AMS)
3	Customer relations (AMS)	Computer aided design (AMT)	Management training (AMS)	Employee empowerment (AMS)
4	Management training (AMS)	Robotic (AMT)	Employee empowerment (AMS)	Customer relations (AMS)
5	Employee empowerment (AMS)	Material requirement planning (IIS)	Office automation (AMS)	Workforce involvement (AMS)

Table 4 Least Preferred Improvement Activities

Rank	Four wheeler automobile industries	Two wheeler automobile industries	General manufacturing industries	Overall manufacturing industries
1.	Robotics (AMT)	Automated guided vehicles (AMT)	Direct numerical control (AMT)	Automated guided vehicles (AMT)
2.	Automated guided vehicles (AMT)	Bar coding (AMT)	Computer aided process planning (AMT)	Automated guided vehicles (AMT)
3.	Automated material handling systems (AMT)	Statistical process control (AMS)	Computer aided engineering (AMT)	Direct numerical control (AMT)
4.	Group technology (AMT)	Recycling (AMS)	Business process re-engineering (AMT)	Robotics (AMT)
5.	Direct numerical control (AMT)	Computer numerical control (AMT)	Group technology (AMT)	Computer aided engineering (AMT)

Information System having mean score value 4.12. General Manufacturing Industries give importance to Advance Management System having mean score value 3.18.

The most preferred improvement activities for Indian manufacturing industries are given in table 3. It shows that top preferred improvement activities for overall manufacturing industries are Total Quality Management (AMS), Management Training (AMS) and Employee Empowerment (AMS). Whereas least preferred activities are Robotics (AMT), Automated Guided Vehicles (AMT), Automated Material Handling Systems (AMT), Group Technology (AMT) and Direct Numerical Control (AMT).

Indian manufacturing industries are much attention to Advance Management System. Advance Management System used to simplify the process. Indian manufacturing industries are not paying much attention Advance Manufacturing Technology.

If Indian manufacturing industries are giving more importance to improve their technology, they have to invest a large amount of capital on technology. If the technology changes, they have change manufacturing environment like change of management and adaptability of such technology in Indian context. Various researchers and academicians are also made this type of observations for Indian manufacturing industries (Dangyach and Deshmukh, 2003, Dangyach and Deshmukh, 2006).

6. CONCLUSIONS

From data analysis it is observed that Indian manufacturing industries are investing more on Advance Management Systems as compared Integrated Information System and Advance manufacturing technology. It indicates that Indian industries want to gain competitive advantage by giving more emphasis on Advance Management System as compared to technology. From the data analysis it is observed that Indian manufacturing industries are simplifying the process with the help of Advance Management Systems such as Total Quality Management, Management Training, and Employee Empowerment etc. After simplification Indian manufacturing industries are integrating the various functions through information systems such as Material Requirement Planning, Enterprise Resource Planning, Material Resource Planning and Activity Based Costing. At last Indian manufacturing industries are giving importance to automation. Indian manufacturing industries are automating their processes with the help of Advance Manufacturing Technology such as Flexible Manufacturing System, Computer Numerical Control, Computer Aided Design, Group Technology etc.

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