Automation Impact on Indian Steel Industry

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Abstract

With the increased competition and demand in the global market, automation is becoming the necessity. Through the adoption of more efficient and advanced technologies, the increase in productivity in the manufacturing sector is effective in merging economic, environmental, and social development objectives. In the Indian steel industry modernization, a very important role has been played by automation for making it possible to compete in global market. The main advantage the Indian Steel industry is

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having the availability of domestic raw material and low labor cost. In the present work an attempt has been made by literature review to identify the automation parameters and their effects on the Indian Steel Industry

Keywords: Automation, Indian Steel Industry, Government Policies, Technological Advancements.

1. INTRODUCTION

Indian steel industry has entered into a new developmental stage and on the world chart, India is at fifth place among countries producing highest crude steel. Per capita steel consumption is an indicator of the economic growth of a country. Due to the globalization of Indian economy and development of the industries using steel as raw material like automobile industry, railway, defense etc. in the country, the steel consumption in India is also increasing. The main advantage for the Indian Steel Corporations is that the availability of the domestic raw materials and low labor wages as compared to the rest of the world.

Going through the history, modern Indian steel sector started way back in 1907 when Tata Iron and Steel Company established its plant and the steel production started in India in 1913. After the liberalization of Indian economy and removal of large number of controls in 1991-1992, an era of development has been experienced in steel industry and as consequences India became the fifth largest crude steel producing country with China on the top. The use of new sophisticated automatic control techniques and opening up the steel sector to private sector in India made it possible to compete in the world market.

2. STUDY AREA

The present work focuses on the literature review on the automation and co-relating the advancement in automation with the development of the Indian Steel industry. Considering the domestic and global scenario of steel industry by studying the various reports published by Indian Government a comprehensive study is made to find the effects of automation on the Indian Steel corporations.

2.1 Objectives of Research Study

The paper focuses on the decision variables which the enterprises consider while automating its production system. An attempt has been made to segregate the decision variables from the available literature into three broad classifications which are: Internal variables, External Variables and competitive Variables.

2.2 Evolution of Frame Work

With the globalization of markets after World War II, the competitiveness in the global market has increased and there is increasing demand of good quality products. The literature on automation is reviewed under three cardinal dimensions which are Internal Scanning, External Scanning and Competitive Positioning. Eleven major parameters are explored under these three cardinal dimensions as shown in the Figure 1
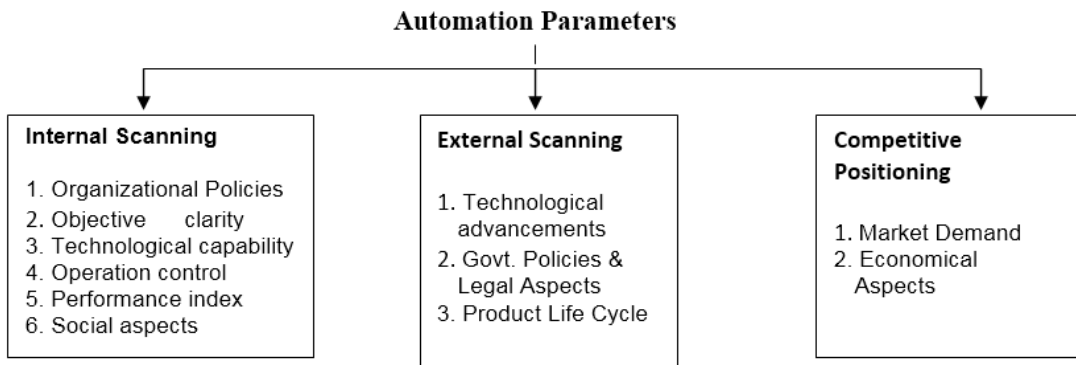

Figure 1. Decision Variables of Automation

2.3 Exploratory Decision Variables from Literature Survey

Total 42 number of research papers are scanned for exploring the variables of automation and the following 11 major parameters were explored from these papers under the 43 decision variables as shown in the Table 1 with the references given.

Table 1. Explored Parameters of Automation

S. No.	Adjuvant dimensions	Decision Variables	Research papers
1	Organizational Policies	1. Organizational Structure 2.Firm size 3. Company's strategy and goals	2,4,11,13,14,19,29
2	Objective clarity	4. R&D expenditure to sales ratio 5. Industrial standards	4,12,15,37
3	Technological capability	6. Innovation cycle 7. Safety 8. Engineering & material database 9. Interrelation between production units	1,4,5,6,8,9,11,12,13,14,18, 22,23,26,28,33,34,35
4	Operation control	10. Remote calibration 11. System accuracy 12. Supervision 13. Integration 14.Modeling	1,3,6,8,10,12,13,17,19,20,2 123,25,27,31,32,34,35
5	Performance index	15. Productivity 16. Price recovery factor 17. Yield 18.Throughput 19. Turnover	4,5,9,15,16,21,24,36

6	Social aspects	20. Labor force 21.Labor productivity 22. Motivation	4,7,10,16,19,21,22,26,36,37,38
7	Technological advancements	23. Hardware, Software and System ware 24. Neural Networks and Artificial Intelligence 25. Adaptability 26.Opacity	1,6,7,8,10,14,18,21,26,27,28 31,33,34,35,40,41
8.	Govt. Policies & Legal Aspects	27 Govt. Policies 28. Labor unions 29. Environmental awareness 30. Unemployment 31.Vocational education 32. Direct &indirect labor cost 33. Manufacturing pro activeness	1,2,4,17,19,22,23,25
9.	Product Life Cycle	34. Product Variety 35. Customer Services 36.Demand	3,4,5,7,8,11,15,18,26,38
10.	Market Demand	37. Market development 38.Market share 39. Competition 40.Integration of production & business studies	2,4,15,16,21,23,24,29,34,37,39,40,42
11.	Economical aspect	41. Sales per employee 42. Budgeting 43. Profits	2,11,12,14,17,22,24,27,28,29,37,39,42

Table 2 shows the distribution of focus of research study over a span of time. The time span is divided into four parts and number of research articles studied is divided according to the parameters of automation given in Table No.1

Table 2. Distribution of Focus of Research Study over a Span of Time

| S. No.	Adjuvant dimensions	Before 1980	1980-1989	1990-1999	2000-2010
1	Organizational Policies		4	2	1
2	Objective clarity		1	2	1
3	Technological capability	2	8	3	5
4	Operation control	3	6	4	5
5	Performance index		2	4	2
6	Social aspects	4	3	2	1
7	Technological advancements	4	6	1	4
8.	Govt. Policies & Legal Aspects	1	2	4	1
9.	Product Life Cycle	2	1	5	1
10.	Market Demand		2	6	2
11.	Economical aspect		5	5	1
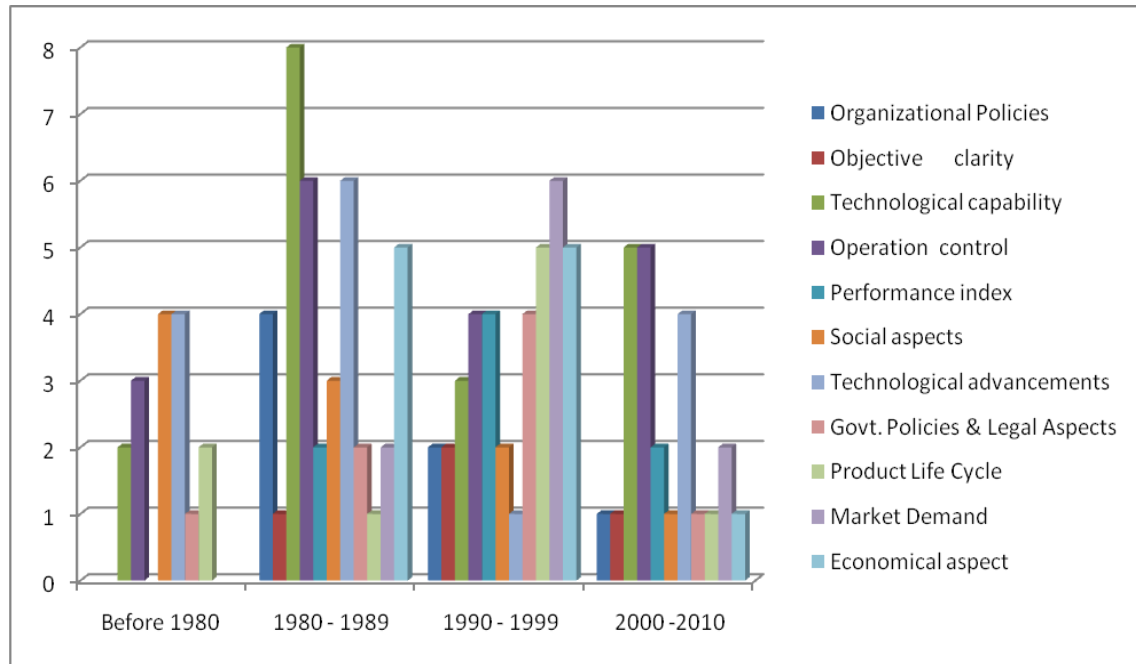
Figure 2. Graph of Focus of Research Study over a Span of Time

3. CONCLUSIONS AND DISCUSSIONS

From Table 2 and Figure 2 it can be concluded that before 1980 the main focus of the research was on the technological advancements and the effect of automation on the society and workers. In the decade of 80's the research had shifted to the technological capabilities and technological innovations so as to renovate the previous production system. Beside this the budgeting of the automation projects and profits were also studied during this period of time. But in 90's beside the technological advancements, the market behavior also was also studied to find the effects of the process of automation. Govt. and legal aspects also played a major role during this decade. But during 2000-2010 technological advancements and capabilities and operation control were the major research topics. Over the period 2002 to 2007 the production of steel in India has increased by a compounded annual growth rate (CAGR) of 8 percent. In comparison to world average, projected growth in India is higher. Whereas in India consumption of steel per capita is far below the average of world and that of developed countries. The major changes in Government policies after the liberalization of Indian economy which caused the automation and development of Indian steel sector are:

1. Removal of large plant capacities that were reserved for public sector;

2. Elimination of restrictions on export;

3. Reduction in import tariffs from 100 percent to 5 percent;

4. Decontrol of domestic steel prices;

5. Encouraging the foreign investment, and giving high priority to the steel industries foreign investments.

6. Replacement of freight equalization scheme with system of freight ceiling.

The automation has affected the manpower requirement. For example in Rourkela Steel plant the manpower has declined from 21680 in 2006-07 to 19455 in 2009-10. Although for same period of time the labor productivity has increased. It is observed that due to automation introduced in Blast furnace, Steel Melting shops and reheating furnaces the output has increased by about 8-10% and in rolling mills the output has increased by 15% (Rajat Kumar Panigrahy, Ashok Kumar Panda and Srikanta Patnaik, 2011).

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