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Selection Criteria of Manufacturing Systems: A Review

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ABSTRACT

The paper's goal is to examine the wide range of existing research correspond to various manufacturing systems and criteria for selection of appropriate latest manufacturing system. Traditionally selection of appropriate latest manufacturing system has not been considered as a vital issue.In the era of globalization, it is most important to select and adopt a manufacturing system like lean, green, agile, leagile, FMS, CIM or integration above mentioned system to make an organization competitive. This paper provides the inside of various manufacturing system and the criteria required to select appropriate manufacturing system

1. Introduction

The 20th century brought continuous challenges for production companies and designers of manufacturing systems. Globalization, rising competition, and fast technological progress created higher customer expectations. To cope with these pressures, adopted advanced approaches in industries such as Agile Manufacturing (AMS), Green Manufacturing (GMS), Total Productive Maintenance (TPM), Total Quality Management (TQM) and Lean Manufacturing (LMS). Later, technically advanced systems like Computer Integrated Manufacturing System (CIMS) and Flexible Manufacturing System (FMS) were also introduced. In India, SMEs followed the same trends. Studies such as Seth and Ghosh (2005) using Value Stream Mapping (VSM) showed improved productivity and reduced waste. Manufacturing system between business functions and strategic policies for successful market outcomes.[1]

The goal of the study is to define various manufacturing systems which are implemented in many organizations and different Criteria to select appropriate manufacturing system.

2. LITERATURE REVIEW

A methodical strategy to finding and removing waste through ongoing development, lean manufacturing follows the product of the Customers request in an effort to achieve perfection [1].

According to Womack and Jones in 2003 any organization can implement lean Principles. The manufacturing and service sectors have embraced the lean Idea. [14]

With customer demands changing frequently, supply chain systems face difficulties in ensuring the best quality and quantity based product **delivered to correct place, at accurate time, and at flexible cost**. For handle this challenges, **Agile Strategy** was proposed. For supply chains to effectively satisfy changing customer demands, this strategy places a strong emphasis on flexibility, responsiveness, and adaptability [10].

Agile manufacturing can be defined as the capability of surviving and prospering in a competitive environment of continuous and random change by reacting quickly and effectively to changing markets, driven by customer-designed products and services. [3]

A concept of Agility in manufacturing was inscribe by a member of researchers at Iacocca Institute, Lehigh University, in 1991 to describe the practices observed and remember as important exposure of manufacturing due to their investigation.[18]. Van Assen et al. (2000), Decentralization is critical for agile organizations because it distributes decision-making authority, allowing different segments to react quickly and effectively to a changing environment. [13] Agility is a business-wide capability that information system, embraces organizational structures, logistics process and in particular, mindsets. Agility is being defined as the ability of an organization to respond rapidly to changes in demand, both in terms of volume and variety. [9]

In today's scenario the E-waste is the major issue, green technology is the application of more than one of environmental science, green chemistry, environmental monitoring and electronic drives to monitor and conserve the natural environment and resource. [5]

Rapid technological and economic growth, along with mass production, has caused a rise in industrial waste, toxic discharges, and harmful emissions. Manufacturing has therefore become a major contributor to environmental pollution. Green manufacturing, which aims for cleaner processes, effective resource

usage, lower emissions, and eco-friendly production to ensure both environmental safety and sustainable growth, is being adopted by companies to lessen this impact [7].

The aims of Green manufacturing is to reclaim municipal or industrial waste and is an increasingly important consideration, which also provides opportunity for sustainable development of enterprise [6]. Fiksel (1996) gathered different analytical tools like Life cycle Analysis (LCA),design for the environment (DFE),screening method and risk analysis, which have emerged from product/process design research for green manufacturing [11].

One technique that has been suggested to help make eco-friendly decision is material flow cost accounting. MFCA provides a foundation for the development of further environmental management accounting activities which may include investment appraisal, environmental impact assessment and short or long term environmental budgeting [15].

A crucial component of sustainable development in the contemporary manufacturing sector is green production. By the use of eco friendly methods and technologies it offers an unique approach that step down pollution, saves energy and maximizes resource utilization which increasing efficiency while preserving environmental preservation and sustainable development is the goal [16].

Computer-Integrated Manufacturing Systems (CIMS) provide a unified approach to improve the overall performance of manufacturing organizations by integrating various production processes. [4]. CIMS ensures that all customer-oriented functions operate efficiently and in coordination. It involves the use of computer technology to assist, monitor, and automate manufacturing operations at multiple levels. The main objective of CIM is to link different automated units, often referred to as “islands of automation,” into one cohesive and intelligent network [12] .These separate automated Production Island included Computer-aided manufacturing (CAM) Computer-aided process planning (CAPP), Material requirement planning (MRP), Computerized numerical control (CNC), distributed numerical control (DNC), NC machines, computer controlled material handling equipment automated storage, and robotics [12].

According to Boaden and Dale (1990), system of **Computer Integrated Manufacturing** offer several advantages such as **lower costs, reduced lead times, greater flexibility, improved efficiency and faster response** to changing customer demands.

Introduction of Computer-Integrated Manufacturing can be prompt to human resource and organization change within manufacturing industries and they discussed the long term gain, which are expected to

accrue from full CIM implementation and have also discussed in which organizational and social problems may be destroyed in the implementation of Computer-Integrated Manufacturing [17].

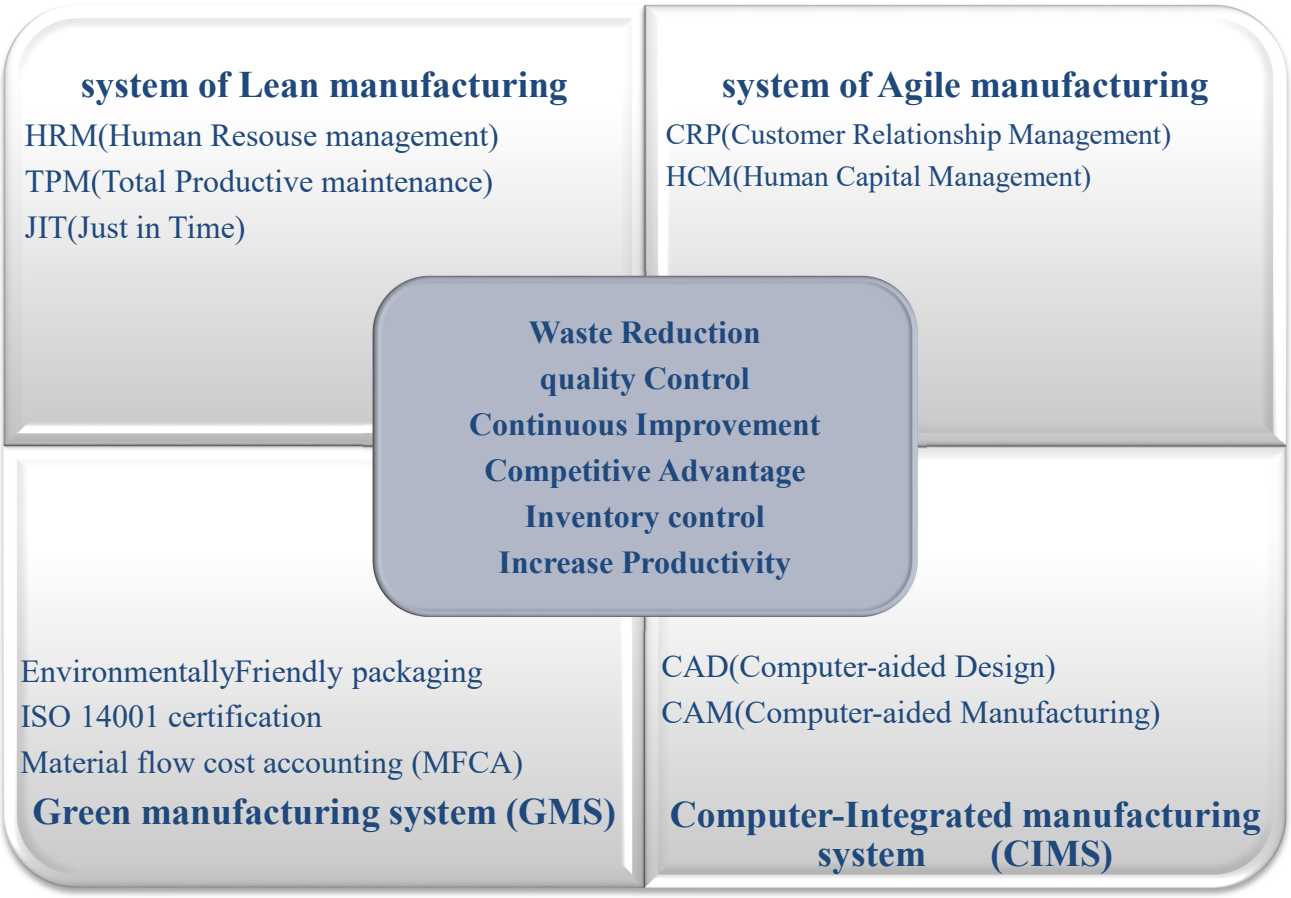

Figure 1: Comparison of various manufacturing system

3. MANUFACTURING SYSTEMS AND SELECTION CRITERIA

Selection of manufacturing system is most important decision for all industries to sustain in the market.Table 1 shows the difference between manufacturing system by the different criteria that are used to select manufacturing system and to justify the concept of manufacturing system.

The Search Process was focused on recent five years articles. We disolate references for which full text was unavailable further, we refer the reader to focus on various Journals which are related on manufacturing system selection or to justify it.

Table 1: Production methods and selection standards

Sr. No	CRITERIA	**Manufacturing system**

		System of Lean Manufacturing	System of Agile Manufacturing	System of Computer Integrated Manufacturing	System of Green Manufacturing system
1	Cost	✓	✓	✓	✓
2	Quality	✓	✓	✓	✓
3	Flexibility	✓	✓	✓	
4	Productivity	✓	✓	✓	
5	Morale	✓		✓	
6	Innovation /change	✓	✓	✓	
7	Competitive advantages	✓	✓	✓	
8	Lead times		✓		
9	service	✓	✓		✓
10	Delivery	✓	✓		✓
11	Utilization	✓		✓	✓
12	Risk				✓
13	Environmental collaboration				✓
14	Environmental impact				✓
15	Environment and safety				✓
19	Elimination of waste	✓	✓		✓
20	Market sensitiveness	✓	✓		
21	Management responsibility	✓			
22	Workforce	✓	✓		
23	Manufacturing management	✓			
24	Technology	✓	✓	✓	

25	Manufacturing strategy	✓			
26	Integration				
27	Team building		✓	✓	

4 . CONCLUSION

The purpose of this paper is to review of the literature on the Manufacturing system. We have presented a contemporary review of articles (Table 1) to select appropriate Manufacturing system in all organization. We considered four manufacturing system Agile manufacturing system, Lean Manufacturing system Green manufacturing system, Computer Integrated manufacturing system. We taken in to consideration many criteria to select an appropriate manufacturing system from the literature survey. We provide a few key or standard factors for choosing the best production system, including cost, quality, productivity, flexibility, environmental effect, innovation, and competitive advantage. Above mentioned manufacturing system have its own advantages to other manufacturing system. Lean manufacturing system focus on to reduce or to eliminate the different waste in the organization. Agile manufacturing system focus on rapidly change in customer demands regarding the quantity and diversity of products. Green manufacturing system has potential benefits of higher productivity with reduced environmental impact with the globalization. CIMS focus on automation in all level of manufacturing industries and high degree of accuracy of parts.

From the literature review, we analyze some potential issues like waste reduction,minimization of environmental problems, continuous improvement and competitive advantage over other firms. In the era of globalization and highly competitive market, it will be difficult to survive for any organization by focusing and implementing any one manufacturing strategy. Organizations need to look beyond these boundaries and should think innovative to overcome these issues. One possible solution could be the selection and implementation of hybrid manufacturing systems like Lean and Green manufacturing system which assures both economic and environmental improvements.

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