

An Analytical Paper on Agile Manufacturing

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Abstract: This paper provides an exploration of Agile Manufacturing (AM) concept and content. It describes the nature of the AM, and synthesizes the literature to propose a comprehensive purpose and process definition. Real Agile Manufacturing (RAM) is seen as a strategic process; it is about surviving and prospering constant and rapid change in the competitive environment by responding rapidly and effectively in markets. The customer's needs are highly specific and rapidly changing, they still want products and services of high quality and low cost. The company should respond to rapid, continuous, new and predictable environmental changes and should provide a sufficient variety of products or services to survive and be competitive. This manufacturing method resulted in inflexible plants that are not quickly reconfigurable and filled with inventories of bloated raw materials, work in process and finished products. Industry analysts have popularized the words world-class manufacturing and agile manufacturing to reduce excess inventory, shortened lead times, allow consistency in the flow lines and improve the advanced quality levels in both goods and customer service.

Keywords: Agile Manufacturing, Management, Manufacturing, Organisation, Real Agile, Structure.

INTRODUCTION

Agile manufacturing represents continuing development of manufacturing responses in competitive pressure. Agile manufacturing can be seen as evolutionary in the same way that it is a logical progression from existing production systems. The competitive market, industrial manufacturers are hard pressed to adopt new techniques and innovations for enhancing product quality, reducing lead time for the product and lowering manufacturing costs. Agile manufacturing is a business concept and its goal is quite simple-putting our companies in front of main competitors[1]. Agile Manufacturing is to merge company, people and technologies into an integrated and organized manner. Agile manufacturing powered by customer-designed products and services, can be described as the ability to survive and succeed in a competitive environment of rapid and unpredictable change by responding quickly and effectively to changing markets. Agility principle refers to a business model that protects an enterprise from damage caused by unpredictable events and changing circumstances. Agile Manufacturing is a combination of speed and flexibility that is hard to achieve because traditional thinking requires to radical changes. Agile Manufacturing model is designed around the convergence of a number of companies each have certain core skills or competencies so that they bring to a joint venture project based on the use of the facilities and resources of each partner[2].

The implementation of advanced information technology is creation of highly flexible organizational structures to help highly skilled, competent and motivated people to make joint ventures. Agile Manufacturing shows effectiveness of lean manufacturing, uses and it also introduces individual power and the resources that new technologies bring. Agile manufacturing encourages the development of new ways to interact with consumers and suppliers. Consumers are able to gain access to the products and services, but they will also be able to easily assess and leverage the skills so that they can use these abilities to achieve the things they are looking for[3].

1. Agile Manufacturing Structure:

Agile Manufacturing can be seen as a system where each company can create its own business strategies and products. Three key tools support the system i.e., a capacity base of competent and motivated people, innovative management structure and organisation, and versatile and smart technology. Agility is gained by combination of these resources into a coordinated and interdependent system. When agile development is viewed as a structure, four main dimensions can be viewed as its sub-systems[4]. Figure 1 shows agile manufacturing structure.

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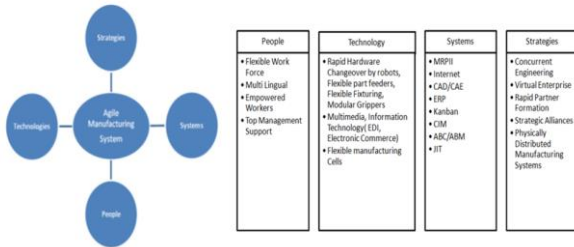


Figure 1: Agile Manufacturing Structure

2. Evolution of Agile Manufacturing:

The industrial age triggered by the industrial revolution is supported by a favourable convergence of factors like technological development including a steam engine, viewed as a catalyst breakthrough leading to industrialisation, mass supply of raw materials like iron, wood, oil, availability of labour, and emergence of business leaders. Industrial revolution is shifted from craft production to mass production. The weaknesses and complex nature of manufacturing, the pattern has changed from industrial age to information and post information ages[5].

Agile manufacturing is a business strategy aimed at providing a company with the ability to succeed in the changing environment and demands flexible solutions. The new paradigm has emerged due to the weakness of earlier paradigms, and agile manufacturing can also use methods of other manufacturing paradigms[6]. Figure 2 evolution of agile manufacturing.

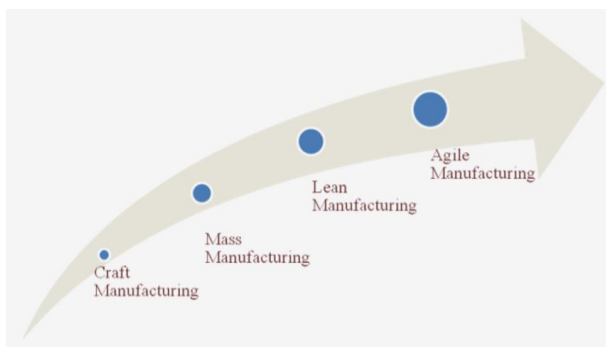


Figure 2: Evolution of Agile Manufacturing

3. Needs of Agile Manufacturing System:

An agile business needs highly qualified and experienced individuals who are versatile, motivated and receptive to change. An agile company also needs new forms of

organizational structures that generate non-hierarchical styles of management and also stimulate and support individuals, as well as cooperation and teamwork. Agile manufacturing companies also need advanced computer-based technologies for information, integration and knowledge sharing. Agile Manufacturing businesses will need to combine a wide range of knowledge in the design of a manufacturing system that includes vendors, consumers. It should also address all dimensions of the system including organisation, people, technology, management, accounting and practices. The interrelated existence of all these fields implementing as standard practice in interdisciplinary method of designing and manufacturing systems. It means going beyond the multidisciplinary methods being adopted and looking at areas between professions. The factors in which agility is provided in the organization such as advanced technology, organization, trained and skilled personnel working in an integrated way[7]. Figure 3 shows agility implementing model.

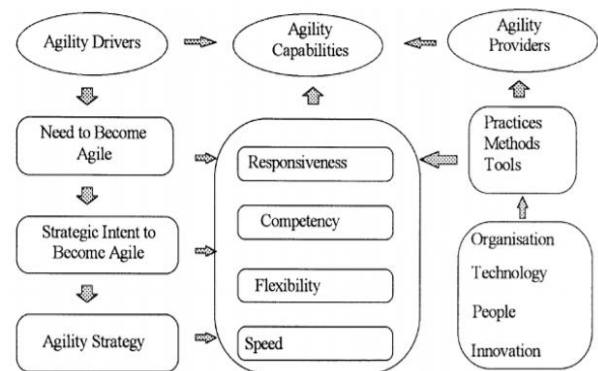


Figure 3: Agility Implementing Model

4. Comparison of Agile Manufacturing and Other Manufacturing Methods:

The long cycle time is traditional production system in which causes delay in the delivery of the products. The problem here is the lack of strategy and no participation of employees which creates financial confidentiality and record inaccuracy. The benefits in the sense of world-class manufacturing are long-term competitiveness, improved productivity and less time to market as opposed to the traditional production system. The agile manufacturing is system which focuses in the integration of design and manufacturing under one roof. In comparison to the conventional development approach,

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)

Vol 5, Issue 3, March 2018

agile manufacturing focuses on consumer satisfaction, competitiveness through teamwork, and this could be accomplished by integration of individuals, knowledge and technology, highly educated and trained workforce on the same roof. Improving competition among competitors and building cooperation from all companies, thereby affecting the sharing of information and technological innovations[8].

5. Challenges of Agile Manufacturing:

In the current knowledge based age, interdisciplinary design must form the basis of the design for agile manufacturing systems. Interdisciplinary design means simply applying expertise from other disciplines, such as psychology and organizational science. It is also looking for new knowledge, new ideas, and original approaches in the unexplored areas between these fields and the areas where they intersect. This is one of the most significant challenges facing administrators and program designers and integrators in the years ahead. Interdisciplinary design brings to new approaches and new ways of thinking. The challenges and problems in the manufacturing world are very complex. The various components and elements have a massive number of interconnections. A manufacturing enterprise is so complex that it is impossible to cope with as a whole in the past, and it had to be reduced to manageable areas that tended to be examined separately[9].

6. Characteristics of Agile Manufacturing:

The agile manufacturing characteristics are at the strategic level, where strategic aspects of agile manufacturing are defined as follows:

- a) *Enriching the consumer*-an agile business is one that its consumers view as greatly enriching them in a significant way.
- b) *Cooperating to enhance competitiveness*-Cooperation internally and with other companies is the operating approach of first preference for an agile company.
- c) *Organizing to master change and uncertainty*-An agile company is organized in such a way that it is thrive on change and uncertainty, its structure is flexible enough to allow for a rapid human and physical resource configuration.
- d) *Leveraging the impact of people and information*-The management of an agile business nurtures a culture of creativity that leverages the influence of people and knowledge on operations[10].

One can move from these strategic dimensions of agility to consider the tactical and technological dimensions. The benefits of agile manufacturing are short time to market, low volumes, low quantities, fast new product development, high product mix, configurable components, short/fast order processing, fast supplier deliveries, short lead times, highly flexible and responsive processes, highly flexible machines and equipment, short cycle times, use of advanced cad/cam, empowered employees, quick changeover[11].

CONCLUSION

Agility is still an area of development. Companies are beginning to move towards agile behaviour, often not in a planned manner, more commonly they are falling into operational and lack strategic direction. Organizations need to understand the basic ideas as a first step and become smart respondents to the concepts. The implementation of agility is still very much needed such as involving radically new concepts concerning strategies, activity, organisation, technologies and people. Agility is a paradigm shift and one must understand the established paradigm and face the often difficult task of recognizing that current practices and beliefs are no longer appropriate or important before one can step forward. The combination of lean manufacturing and flexible manufacturing systems can be described as agile development. At this point it is important to understand that lean manufacturing and flexible manufacturing systems techniques can be used to make agile manufacturing effective in implementation. The rapid changes taking place in the global market make it clear that RAM-based manufacturing companies should become pioneers, but this new management structure, new technology solutions and new ideas need to be implemented on an on-going basis.

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