

“AN OVERVIEW OF AGILE MANUFACTURING: IT’S NEED, APPLICATION AND METHODOLOGY FOR MANUFACTURING INDUSTRY”

Satish M. Silaskar

Head of Department, Department of Mechanical Engineering,
New Horizon Institute of Technology and Management, Thane, India

Abstract: The agile manufacturing paradigm was developed about a decade ago in response to the rapidly changing 'new economy' and as a foundation for regaining global competitiveness. Agility is widely recognized as a developing concern in today's manufacturing industry as a means of responding to rapidly changing market conditions. The use of an agile manufacturing system has proven to be effective in gaining a competitive edge. Modern manufacturing facilities demand smaller lot sizes, faster time to market, and lower manufacturing costs. Agile manufacturing techniques are desirable in such circumstances. While agility can imply different things to different businesses in different situations. Agile manufacturing is a 21st-century manufacturing concept that incorporates technology, organizational techniques, systems, and people. Improves the organization's ability to respond to rapid change and an increasingly unstable economy by going beyond traditional techniques. Agile manufacturing can deliver exactly what clients want, when and how they want it at a low cost. The major goal of this study is to show the numerous application and methodology of agile manufacturing in the research fields that are conceivable in the development of the agile manufacturing age.

Keywords: Agile Manufacturing, Manufacturing Industry, Lean Manufacturing.

I. INTRODUCTION

Agile manufacturing refers to a company that has developed the systems, tools, and training necessary to respond fast to customer requests and market changes while maintaining cost and quality control. It mainly has to do with lean manufacturing. Agile manufacturing is a method of producing goods that focuses on addressing customer requests while maintaining high quality standards and keeping total costs under control. This strategy is designed for businesses that operate in a highly competitive environment, where little differences in performance and product delivery can have a significant impact on a company's long-term survival and reputation with customers. Agile manufacturing is a method for manufacturing which combine our organization, people and technology into an integrated and coordinated whole

Performance in the manufacturing industry is a moving target that requires constant attention and effort, and the process is never-ending. Previously, the manufacturing industry was governed by economies of scale, and everyone knew that mass production and full use of plant capacity were the only methods to make money. This mode of production resulted in inflexible factories that were difficult to reconfigure, as well as inflated raw materials, work-in-process, and finished goods inventories. The terms "world-class manufacturing" and "agile manufacturing" have become common in the industry to describe the elimination of excess inventory, reduced lead times, requirement for flow line flexibility, and enhancement of advanced levels of quality in both items and customer service.

Manufacturing technology, as well as the entire manufacturing industry, are undergoing significant transformations:

- Manufacturing is evolving into a system, one that can no longer be seen, evaluated, or synthesized as a collection of tools and machines. People, tools, materials, products, data, and control programmes are all interconnected in the system. It even incorporates an organization's future products and strategy.

- Manufacturing is increasingly dominated by goods rather than processes. The procedure is enslaving the product. Manufacturing is becoming more science-based, with theory, algorithm, experiment, analytical approach, modelling, and simulation taking precedence over "rule of thumb" intuitive judgment.

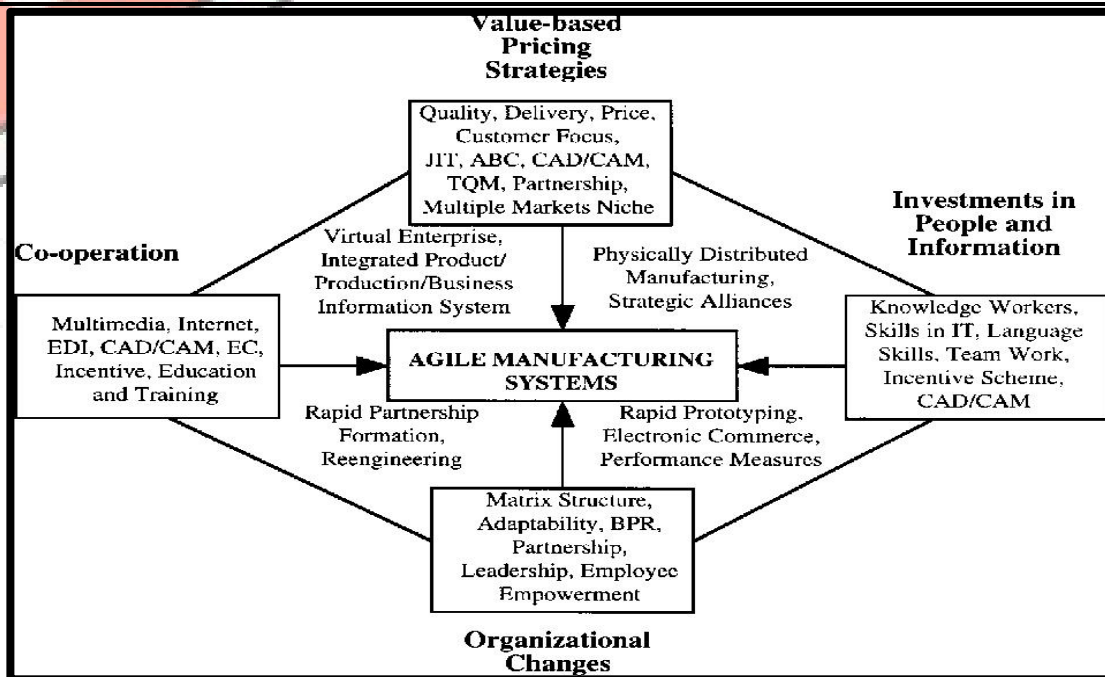


Fig.1: Agile Manufacturing System and Its Components

Agile manufacturing is built on four pillars.

1. **Designing Modular Products** – enables for quick and simple variation.
2. **Information Technology** – allows for cross-departmental communication and quick order response
3. **Partners in Business** – To improve time-to-market for specific products, the company creates collaborations with corporate partners.
4. **Culture of Knowledge** – Employee training contributes to the company's ability to adapt to fast change.

II .Comparison of Agile manufacturing and other manufacturing methods:

Long cycle times are associated with heavy inventory in traditional manufacturing systems, resulting in delays in goods delivery. The issue is a lack of plan, as well as no staff involvement, financial concealment, and inaccurate records. In comparison to the old manufacturing system, the benefits of world-class manufacturing include long-term profitability, increased productivity, and shorter time to market. The agile manufacturing system focuses on design and manufacturing integration as well as all aspects of manufacturing under one roof.

Agile manufacturing, unlike traditional manufacturing techniques, focuses on customer enrichment and competitiveness through collaboration, which may be accomplished by combining people, information, and technology under one roof. A well-educated and well-trained workforce may also aid in this endeavour. Increasing competitor competitiveness and encouraging collaboration among all firms, impacting information transfer and technical innovation sharing.

Table 1; Comparison of Agile Manufacturing And Traditional Manufacturing Methods

S. No.	Criterion	Traditional Manufacturing Company	Agile Manufacturing Company
1.	Status of Quality	Customer satisfaction is the target	Customer delight is the target
2.	Employee's status	Employees are inflexible and ignorant to changes	Learning, multi-skilled, multi-functional, self-committed employees
3.	Design Improvement	Adopted very rarely	Adopted very frequently and systematically by conducting experiments
4.	Outsourcing	Adopted by subcontractors only	Majority of the activities are outsourced
5.	Customer response adoption	It takes place very slowly	Very fast and 100% response is achieved

Agile and Lean Manufacturing

Lean and Agile are two of the most frequently discussed and argued manufacturing philosophies, especially while a transition is ongoing. While there are numerous parallels between the two, producers must understand how and when to implement them.

It was first known as just-in-time (JIT) production, and it flourished in Japan in the 1960s and 1970s before spreading around the world in the 1980s. As the JIT approach gained popularity, various books and articles were produced about it. The terms "speed to market," "cycle time," "lead time," "rapid response manufacturing," and "fast reaction manufacturing" are all used interchangeably. Despite the fact that the concepts and processes were similar to JIT, "lean" became the preferred moniker.

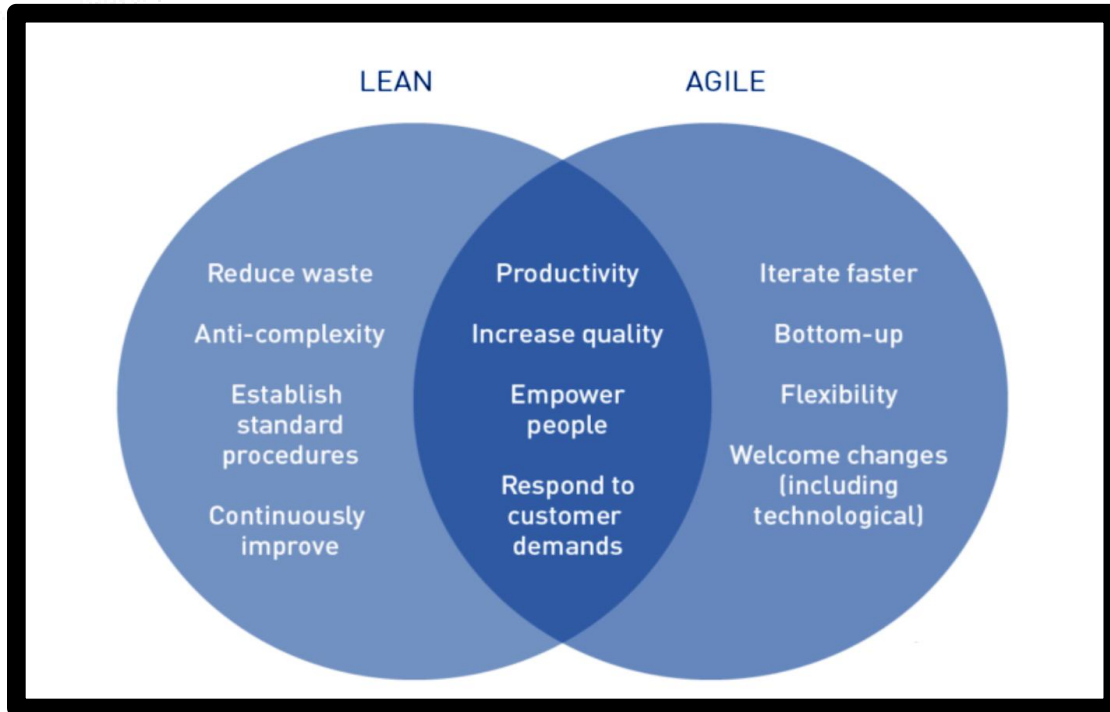


Fig-2 : Agile and Lean Manufacturing

There are some common concepts and methods that both lean and agile manufacturing practices follow. Finally, these programmes are designed to improve a manufacturing company's financial stability. Both are generally enacted for the same reasons. By decreasing waste, Lean Manufacturing adds value to the consumer. Transport, inventory, motion, waiting, overproduction, over-processing, defects, and unutilized talent are the eight categories of waste identified by the Lean framework. Lean practitioners try to complete tasks in the simplest and most resource-efficient manner possible.

Teams in Lean thinking maximize speed by managing flow (typically by decreasing work-in-process), whereas Agile teams stress small batch sizes to produce rapidly (often in sprints). Lean isn't about getting rid of people; it's about increasing capacity by lowering costs and cutting the time between customer orders and delivery. Agile is more than just a technique. It is a mode of thought. It's a holistic approach that fosters a culture in which everyone strives to improve growth and output. It's a human-driven system in which all employees, both within and outside the office, are customers of their upstream colleagues. This generates a pull mechanism that extends from the customers all the way through the manufacturing process to the product design teams and the company's strategists.

Agile manufacturing necessitates, if not necessitates, lean management – that is, the integration of vision, culture, and strategy to provide high-quality, low-cost, and short-delivery-time services to customers. Agile manufacturing firms are currently implementing features of agile manufacturing that will allow them to compete in the global market by providing improved service, quality, design, and flexibility.

III .Need of Agile Manufacturing

However, there are various factors that contribute to agility. A flexible, motivated, and change-responsive organization requires highly competent and knowledgeable individuals. A flexible business also requires new organizational structures that encourage non-hierarchical management approaches, as well as individual collaboration and teamwork. Advanced computer-based technologies are also required by agile manufacturing businesses to combine information and share expertise.

Businesses will need to pool a diverse variety of knowledge in the design of a production system, including suppliers, customers, and staff, to achieve Agile Production. Customers. It should also take into account all aspects of the system, such as the Organization, people, technology, management accounting procedures, and so on. Above all, the interconnected nature of all of these domains must be acknowledged, and an interdisciplinary manufacturing systems design process must be embraced as normal practice.

- Global competition is becoming more intense.
- Niche markets are emerging from mass markets.
- Cooperation between businesses, including those in direct rivalry with one another, is becoming increasingly important.

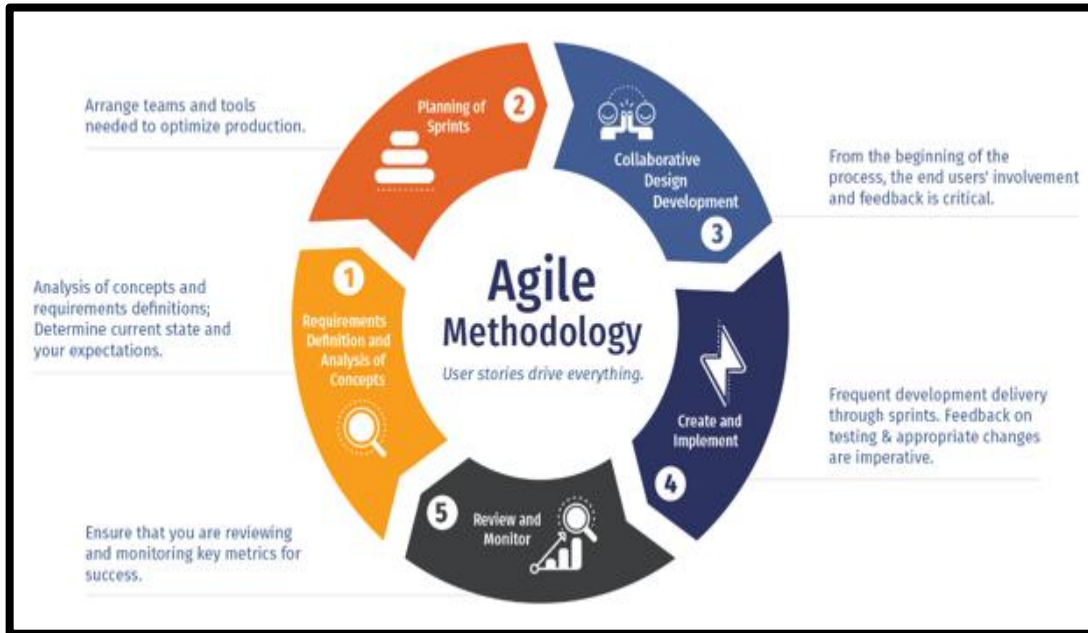
- Low volume, high quality, and custom products are all available.
- Product lifecycles, development time, and production lead times must all be very short.

Agility and Flexibility: Keys to Success

- To swiftly identify client wants and reposition the organization versus its competition.
- To quickly design items based on their unique requirements.
- To quickly put them into full-scale, high-quality production.
- To adjust promptly to changes in volume and mix, as well as to a crisis.

IV. Agile Manufacturing Methodology

Agile manufacturing is a manufacturing process that focuses a high emphasis on quick customer reaction. – translating agility and speed into a competitive advantage It's an intriguing strategy to gaining a competitive advantage in today's fast-paced economy.



The Agile technique divides a project into phases for better management. It necessitates ongoing communication with stakeholders as well as continuous improvement at all stages. Teams go through a planning, execution, and evaluation process once the job begins

• Expense reduction during business downturns.

When business is good, things in a company's operation run smoothly, as the old adage says. When company slows – or, more properly, when sales do not meet expectations – changes in manufacturing or supply chain processes occur. When business is slow, many organisations may either scale down their manufacturing operations or switch to agile procedures. When revenue improves, a company with an agile manufacturing programme can scale back up operations. It is more difficult to rebuild a lean manufacturing programme.

• **Statistics, forecasting, and proactive planning are used extensively by both.** The more data you have and the more accurate that data is, the better results you'll get. Many businesses, for example, use CRM software and other resources to assess their manufacturing processes and identify inefficient areas.

Learning curves will be eliminated or sharply flattened by future industrial technology. These findings are general and apply to all manufacturing industries. Simply put, the future manufacturing must be agile, swift, and adaptable. It has to be effective. It must deal with high levels of product and process complexity. -efficient. It must also regularly produce high-quality goods. The problem is to restore the craftsman's flexibility while preserving mass production efficiency and quality, all while managing more complicated items. The right manufacturing strategy is specific to a self-sufficient industry. Productivity and change can be managed through innovation, involvement, and the motivation for continuous improvement, as well as the availability of supporting technologies. More than merely introducing a few new techniques is required to compete in the global market. Companies must relocate their operations so that their products, quality, and services are unrivalled. In today's extremely competitive industry, implementing agile manufacturing is the greatest option for businesses. It is necessary to get lane in order to become agile. It is a manufacturing philosophy that was developed by the Toyota Production System and is fast replacing mass production. Agile manufacturing focuses on reducing waste in processes, such as the waste of work-in-progress and finished goods inventories, which is a hallmark of mass production

Agile manufacturing aids in the efficient production of high-quality products by allowing businesses to adapt to changes in design, process, product, and mix rapidly and effectively without compromising quality or cost.

CONCLUSION

In this paper the comparison of agile manufacturing and other manufacturing, methodology of Agile and the need of agility in manufacturing industry as per challenges of industry has been presented as overview. Agility is totally used to find the present status of the plant including its weakness and strength.

Every company nowadays is competing with its peers for existing and potential new clients. Customer satisfaction is today's definition of quality assurance, and it's the only way to win the race. Client satisfaction entails producing products that meet customer requests, providing products that meet customer needs, and doing it at lower costs, with more reliability, and on time. Agile manufacturing is a process that allows for quick responses to changing client needs. The study of agility is still in its early stages. Companies are beginning to adopt agile behavior, though frequently not consciously; rather, they "fall into it," and as a result, it is primarily operational and lacks strategic direction.

Companies must first understand the fundamental concepts and become knowledgeable responders to them. Agility is a long-term challenge for firms, and getting there is a journey rather than a destination to be reached before moving on to something else. So, the company can apply agility where it is lagging. Agility is a new paradigm in the manufacturing environment.

References:

- [1] Manivelmuralidaran. V "Agile Manufacturing - An Overview "International Journal of Science and Engineering Applications Volume 4 Issue 3, 2015, ISSN-2319-7560
- [2] H. Sharifi David Zhang "Agile manufacturing in practice - Application of a methodology" International Journal of Operations & Production Management May 2001 21(5/6):772-794
- [3] Shashi Ranjan, Prakash Kumar "Application of Agile Manufacturing in Small and Medium Scale Industries" International Journal of Science, Engineering and Technology Shashi Ranjan et al. 2016, Volume 4 Issue 6
- [4] Jeffrey K. Liker, Editor, "Becoming Lean", Productivity Press, Portland, Oregon, 1998.
- [5] M. P. Chowdiah, Gopinath Gargesa, "Agile Manufacturing", p.p-61-68, Tata McGraw Hill publishing, 1998.
- [6] B. S. Somashekhar, "Small Scale Industry-An Ideal Candidate for Agile Manufacturing", p.p.-79-82,
- [7] Kidd, P.T., "Agile Manufacturing-Strategy for the 21st Century, IEEE Trans. 1996.
- [8] O'Connor L., Agile Manufacturing in Responsive Factory", Mechanical Engg. P.p.-54-57, July 1994.
- [9] Chris Forsythe., Ashby.M.R., Human factors in agile manufacturing, Journal of Ergonomics in Design, 4(1), pp.15-21
- [10] Cho.H., Jung.M., Kim.M., Enabling Technologies of the agile manufacturing and its related activities in Korea, Computers and Industrial Engineering Journal, 30(3),pp. 323-324
- [11] Don-Taylor,G. and Nagi,R., Agile manufacturing in material handling and logistics:Implications and a researchagenda. Progress in Material Handling Research, 1996, pp. 9±13.
- [12] Gunasekaran.A, Agile manufacturing :endblers and an implementation frame work, International Journal of Production Research, Vol 36, No.5,1223-1247.
- [13] Gupta.P., Nagi.R, Flexible optimization framework for partner selection in agile manufacturing. IERC Proceedings 1995, 4th Annual Industrial Engineering Research Conference, Norcross, GA, USA, pp 691-700
- [14] Gupta.S, Herrmann.J.W., Lam.G, Minis.I, Automated high level process planning to aid design for agilemanufacturing, IERC Proceedings 1997, 6th Annual Industrial Engineering Research Conference, Norcross, GA, USA, pp1-19
- [15] Luis M. Sancher, Rakesh Nagi " Review of Agile Manufacturing System" International Journal of production Research, 2001 Vol.39, no.16,ISSN 0020-7543 print / ISSN 1366- 588X online, Taylor & Francis Ltd.3561-3600

[