

# Reconfiguration of Organization Structure and Practices to Achieve Agile Manufacturing in Micro and Small-Scale Industries

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## Abstract

In this paper reconfiguration of the organization is proposed to Improve agile manufacturing methodology in micro and small-scale custom product manufacturing industries. In this study 114 available micro and small-scale industries are visited in and around Mangalore- Puttur belt to identify manufacturing culture and organization structure. The reconfigured structure was developed based on the results of the survey and its analysis. For the survey, 84 questionnaires were prepared to know the organization, and its working, and the analysis identified key factors that influenced the performance of the industries. To improve the efficiency and performance of micro and small-scale industries “SPOKES OF AGILE WHEEL” is proposed.

**Keywords** - Agile manufacturing; Small-scale custom product manufacturing industries; Micro and small-scale industries

## INTRODUCTION

The sustainability of industries depends on what quality product it gives to customers, the price of the goods, and how early it reaches the customer. The days go by the requirement of customer changes, and fulfilling these dynamic changes of requirements are very difficult and crucial tasks for every industry.

There is different manufacturing methodologies commonly used in medium and small-scale industries. i.e., A manufacturing technique known as mass production involves using assembly lines and specialized equipment to produce standardized goods on a big scale. In order to satisfy strong customer demand, it is characterized by the effective manufacture of huge numbers of items, frequently at a reduced cost per unit. The industrialization and economic development of many nations were greatly aided by this production technique, which revolutionized a number of different industries.

### **Principal aspects of mass production are:**

**Standardization:** To reach high levels of efficiency and consistency, mass manufacturing depends on standardized designs, components, and processes.[1].

**Assembly Lines:** Production is organized along assembly lines, where each worker is responsible for a particular task and the final product is assembled as it progresses along the line [2].

**Specialized machinery** reduces the need for manual labor and boosts productivity by being built and set up to carry out specialized duties during the production process. [3,4]

**Economies of Scale:** As production volume rises, economies of scale usually result in lower unit costs, lowering the price of mass-produced goods. [5,6]

**Interchangeable components:** Using interchangeable components in mass production makes it simple to assemble and repair goods.[7]

Henry Ford's adoption of the assembly line for the production of automobiles throughout the early 20th century helped popularize the idea of mass production. Ford used the assembly line in an inventive way that dramatically decreased the time and cost associated with producing cars, increasing accessibility to automobiles for the general public.

While mass production has been very effective at producing huge numbers of standardized products in an efficient manner, it has also come under fire for its effects on the environment, the lack of product customization, and potential harm to workers' job happiness as a result of repeated duties.

**Lean Manufacturing:** A systematic strategy to maximize value while minimizing waste in the production process is known as lean manufacturing, sometimes known as lean production or lean management. It is derived from the Toyota Production System (TPS) and places a strong emphasis on waste reduction, continuous improvement, and effective material and information flow. In order to increase efficiency, quality, and customer happiness, lean concepts attempt to reduce non-value-added operations including excess inventory, overproduction, and pointless waiting times.

**Lean manufacturing's fundamental traits include:**

**Focus on Value:** Identifying and giving top priority to tasks that directly benefit the client. [8,9]

**Eliminating waste** in different forms, including excess output, faults, waiting, too much inventory, pointless motion, and underutilization of personnel abilities [10].

**Encouragement of a culture of continuous improvement** in which staff members at all levels participate in finding and putting into practice process improvements.[11]

When products or services are produced **just in time (JIT)**, inventories are kept to a minimum, and associated carrying costs are reduced. [12,13]

**Pull System:** Putting in place a production system focused on pulling goods from customers rather than pushing them based on projections.[14]

**Agile manufacturing** is a more modern idea that was developed in response to the demand for customization and quick product creation from customers and the changing market dynamics. Agile manufacturing emphasizes adaptability, responsiveness, and the capacity to respond fast in response to shifting consumer needs and market circumstances. It places a focus on the capacity to produce a range of goods in small amounts effectively.

**Agile manufacturing's key traits include:**

**Flexibility:** The ability to efficiently and swiftly adjust to changes in production volume, product design, and consumer demands.[15]

**Prioritizing client needs** and adjusting products or services to satisfy specific consumer wants are examples of being customer-centric.[16]

**Designing manufacturing systems and processes with interchangeable** and reconfigurable parts to support a range of products is known as modularity.[17]

**Collaboration and communication:** Encouraging open, cross-functional communication and collaboration to facilitate rapid decision- and problem-making.[18]

**Rapid prototyping** is the process of creating a product quickly and iteratively in order to shorten the time it takes to market.[19]

Agile manufacturing is a manufacturing philosophy that can improve the productivity of Industries to cope with a dynamic market. The agile manufacturing philosophy is supported by three pillars organization, people, and technology. These three pillars can alter according to the requirements of agile manufacturing in industries. Giving equal importance to all three pillars is very important to achieve agility in industries. This may be quite easier for medium and large-scale industries but for micro and small-scale industries it is quite difficult to change technology because that requires huge investment in technology, in this regard this research concentrated on all three pillars to change organization structure and behavior of the employees to improve the productivity of the industries.

The agile manufacturing method is one of the most promising methods of manufacturing for dynamic requirements.

## METHODOLOGY

In this research work,

i) Made 84 questionnaires related to agile manufacturing enablers

- ii) Listed out the customized product development industries in and around Mangalore- Puttur belt.
- iii) Collected responses from the employees and owners of the industries by personal interviews and recorded data in Google Sheets in Likert scale format.
- iv) Collected responses are uploaded to the IBM SPSS statistical analysis software for statistical analysis.
- v) Different analyses like mean, correlation, and ANOVA has conducted on collected data
- vi) Based on the analysis result new organization model is developed.

### PROPOSED ORGANIZATION CONFIGURATION

SPOKES of Agile Wheel - Agile manufacturing For Micro and Small -Scale Industries.

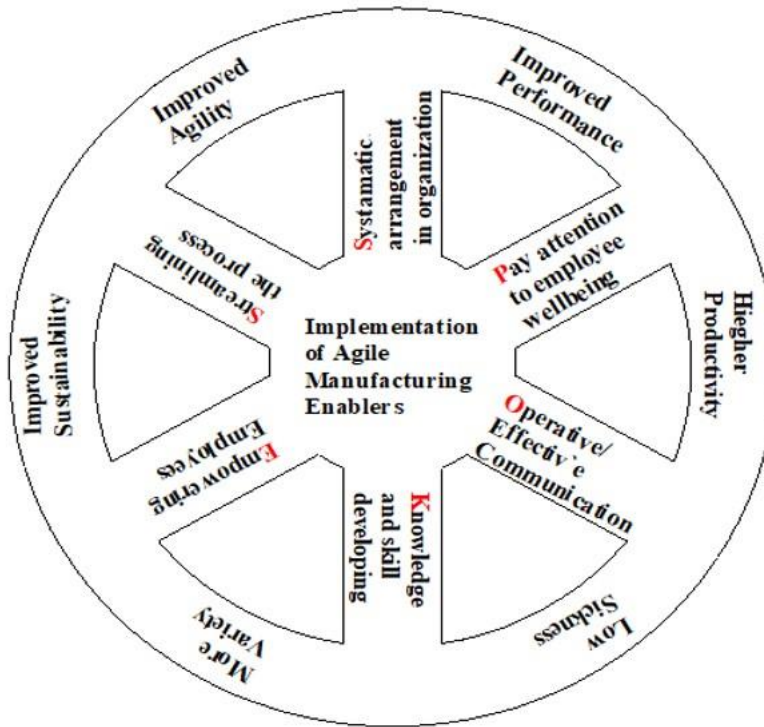


FIGURE1  
SPOKES OF AGILE WHEEL

Fig.1 Shows the SPOKES OF Agile Wheel, here letters of SPOKES denote six key practices/enablers that can implement in every micro and small-scale manufacturing industry.

- S- Systematic arrangement in the organization
- P- Pay Attention to employee wellbeing
- O- Operative communication/ Effective communication
- K- Knowledge development and empowering employees
- E- Empowering employees
- S- Streamline the process

#### *I. Systematic arrangement in the organization*

Systematic arrangement in the organization can play a crucial role in improving agility in micro and small-scale manufacturing industries. Here are some ways in which a systematic arrangement can help:

**Standardization:** Implementing standard operating procedures (SOPs) for different processes can help in achieving consistency and minimizing variations. This can help in reducing waste and improving productivity.

**Streamlined workflow:** A well-designed workflow that is structured and streamlined can help in reducing delays and improve the efficiency of the manufacturing process.

**Automation:** Automating some of the processes can help in reducing errors, minimizing downtime, and improving the speed and accuracy of the manufacturing process.

**Lean manufacturing:** Adopting lean manufacturing principles can help in reducing waste, improve quality, and increase efficiency. This involves identifying and eliminating non-value-added activities, optimizing the use of resources, and continuously improving the processes.

**Continuous improvement:** Implementing a continuous improvement process can help in identifying areas for improvement, testing and implementing new ideas, and tracking the impact of the changes made. This can help in achieving a culture of continuous improvement and innovation.

## *II. Pay Attention to employee wellbeing*

Focusing on employee well-being is crucial to improve agile manufacturing in micro and small-scale industries. Here are some ways to improve employee well-being in the workplace:

**Provide a safe and healthy work environment:** The workplace should be free from hazards, and safety measures should be in place to protect employees from accidents and injuries.

**Encourage work-life balance:** Micro and small-scale industries should encourage their employees to maintain a healthy work-life balance. This can be achieved by offering flexible work arrangements such as telecommuting or flexible working hours.

**Promote employee health and wellness:** Companies can offer employee wellness programs such as gym memberships, healthy food options, and mental health support services.

**Provide opportunities for professional development:** Employees should be given opportunities to learn and grow in their roles. Providing training and development programs can improve employee morale and job satisfaction.

## *III. Operative / Effective communication*

Effective communication is crucial for the success of agile manufacturing in micro and small-scale industries. Here are some ways that effective communication can be implemented:

**Open communication channels:** Ensure that communication channels are open and accessible to all employees. This could include regular team meetings, suggestion boxes, and online platforms for communication.

**Clearly defined roles and responsibilities:** Make sure that each employee understands their roles and responsibilities within the manufacturing process. This will help prevent confusion and misunderstandings, leading to improved communication.

**Regular feedback and review:** Regular feedback sessions and performance reviews are a great way to ensure that employees are aware of their progress and areas of improvement. This can help improve communication by providing an opportunity for employees to discuss any issues or concerns they may have.

**Encourage collaboration:** Collaboration between employees and departments can help identify areas of improvement and streamline the manufacturing process. Encouraging a collaborative environment can also foster effective communication and help ensure that everyone is working towards the same goals.

**Use visual aids:** Visual aids, such as charts and diagrams, can help improve communication by providing a clear and concise way to convey information. This can be especially helpful when explaining complex manufacturing processes or procedures.

**Implement regular training:** Regular training sessions can help ensure that all employees have the necessary knowledge and skills to perform their jobs effectively. This can help improve communication by providing a common understanding of the manufacturing process and procedures.

## *IV. Knowledge and Skill Developing of Employees*

Developing employee skills and knowledge is critical to achieving agility in micro and small-scale manufacturing industries. The following are some ways to develop employee skills and knowledge:

**Training:** Providing regular training to employees on new technology, machinery, and manufacturing techniques can help them acquire new skills and knowledge. This can be done through internal training programs, external training courses, or by partnering with educational institutions.

**Cross-functional training:** Cross-functional training allows employees to learn and understand different functions within the organization. This helps to create a more agile workforce as employees can easily adapt to different roles and responsibilities.

**Job rotation:** Job rotation involves moving employees between different roles and departments within the organization. This helps to broaden their knowledge and skills, and also helps to create a more flexible and agile workforce.

**Mentoring:** Mentoring involves pairing less experienced employees with more experienced employees to help them learn and develop new skills. This can be a cost-effective way to develop employee skills and knowledge.

**Knowledge sharing:** Encouraging employees to share their knowledge and experience with each other can help to create a more knowledgeable and agile workforce. This can be done through formal training sessions, informal knowledge-sharing sessions, or by creating a knowledge-sharing culture within the organization.

**Incentives:** Providing incentives for employees to develop new skills and knowledge can help to create a culture of continuous learning and development. This can include offering promotions, bonuses, or other rewards for achieving specific training or development goals.

#### *V. Empowering employees*

Empowering employees is crucial to achieving agile manufacturing in micro and small-scale industries. Here are some ways to empower employees:

**Encourage open communication:** Create a culture of open communication where employees feel comfortable sharing their ideas, concerns, and feedback.

**Provide training and development opportunities:** Invest in your employees' skills and knowledge by providing them with training and development opportunities. This will not only enhance their capabilities but also increase their job satisfaction and motivation.

**Delegate authority:** Delegate authority to employees to make decisions and take ownership of their work. This will help to develop their decision-making and problem-solving skills.

**Set clear goals:** Set clear goals and expectations for employees, providing them with a sense of purpose and direction. This will enable them to focus their efforts on achieving specific targets and improve their performance.

**Recognize and reward performance:** Recognize and reward good performance to motivate and incentivize employees. This can be in the form of financial rewards, bonuses, or non-monetary recognition such as public praise or promotions.

**Foster teamwork:** Encourage teamwork and collaboration among employees to promote knowledge sharing, problem-solving, and innovation. This will also help to create a supportive and positive work environment.

**Provide resources and support:** Ensure that employees have the necessary resources and support to perform their jobs effectively. This includes providing them with the right tools, equipment, and materials needed to complete their tasks efficiently.

#### *VI. Streamlining processes*

Streamlining processes can help improve agility in micro and small-scale manufacturing industries by reducing waste, increasing efficiency, and improving overall productivity. Here are some ways to streamline processes:

**Implement Lean Manufacturing principles:** Lean Manufacturing is a methodology that focuses on eliminating waste in the production process. By using lean techniques such as 5S, value stream mapping, and Kaizen, manufacturers can identify inefficiencies and streamline their processes.

**Automate processes where possible:** Automation can help reduce errors and improve consistency in manufacturing processes. By automating repetitive or time-consuming tasks, manufacturers can free up resources and improve overall efficiency.

**Use technology to improve communication:** By using digital tools such as email, messaging apps, and project management software, manufacturers can improve communication between teams, suppliers, and customers. This can help reduce lead times, increase productivity, and improve customer satisfaction.

**Implement a quality management system:** A quality management system can help ensure that products meet customer expectations and regulatory requirements. By implementing a system such as ISO 9001, manufacturers can improve product quality and reduce the risk of errors or defects.

**Implement a continuous improvement program:** By regularly reviewing and analyzing production processes, manufacturers can identify areas for improvement and implement changes to improve efficiency and productivity. A continuous improvement program can help ensure that manufacturing processes remain agile and responsive to changing customer needs and market condition

The "SPOKES OF AGILE WHEEL" framework offers a complete and efficient solution for micro and small-scale industries to implement Agile Manufacturing. This framework consists of Systematic arrangement, Paying attention to employee wellbeing, Operative communication, Knowledge development and Skill development of employees, Empowering employees, and Streamlining the process. These industries may greatly increase their agility and become more sustainable in volatile markets by adopting this concept and incorporating these essential practices into their daily operations.

First off, "Systematic arrangement" refers to the necessity for an organization to execute Agile Manufacturing in a well-structured and organized manner. This entails meticulously planning and coordinating tasks to make sure that every element of the Agile approach is successfully integrated. Micro and small-scale industries can manage their resources more effectively, cut down on duplication, and improve their manufacturing processes with a methodical setup.

The second point is that "Paying attention to employee wellbeing" recognizes the value of a motivated and engaged team. Employee productivity and loyalty to the company are directly correlated with their well-being and contentment. These industries may promote a positive work culture, which in turn improves efficiency and creativity in their operations, by investing in employee welfare, offering a favorable work environment, and acknowledging their efforts.

Third, "Operative communication" or effective communication is essential for coordination and the efficient exchange of information inside the organization. Teams can work together, share ideas, and quickly resolve problems when there are open and transparent channels of communication. Additionally, effective communication makes sure that everyone understands the organization's goals and its Agile implementation method.

Fourthly, the concept of "Knowledge Development and Skill Development of Employees" acknowledges the importance of making investments in the expansion and development of employees' skills. Micro and small-scale industries can develop a competent and adaptable workforce capable of handling a variety of duties and problems by offering training and opportunities for skill growth. As a result, one is better able to solve problems and respond more quickly to shifting market demands.

Fifthly, "empowering employees" entails giving decision-making and authority to the proper organizational levels. Employees that feel empowered are more likely to take responsibility for their work, come up with creative ideas, and actively promote good change. The Agile ideals of adaptability and responsiveness are supported by this empowerment, which also promotes a culture of continual improvement.

Finally, "streamlining the process" concentrates on removing production-related bottlenecks and inefficiencies. Micro and small-scale enterprises can decrease waste, increase production flow, and boost overall productivity by regularly analyzing and optimizing their processes. They can respond rapidly to market developments and customer expectations by streamlining their operations.

## CONCLUSION

The "SPOKES OF AGILE WHEEL" framework offers micro and small-scale enterprises looking to implement Agile Manufacturing a viable and affordable alternative. These sectors can increase their adaptability and sustainability in volatile markets by focusing on systematic organization, worker wellness, operational communication, knowledge and skill development, employee empowerment, and process simplification. Adopting these best practices will help businesses maintain



their competitiveness, react quickly to market changes, and promote a culture of continuous development, all of which will eventually contribute to their success and growth over the long run.

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