

An Agile Project Management for a Green, Clean and Lean Sustainable Manufacturing

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Abstract: Green technology is taking place to save the environment but need a push for its flexibility through various aspects to bring into micro-manufacturing which use less resources and energy by having agile approach in project of green production to minimize the pollution on mother earth. For entire world of manufacturing, efficiency is father. Use of resources available and have the final product ready with complete use of only available resources promotes green manufacturing in a way, only if lean approach is used. This entire system became complex, as conditions from different areas getting integrated in one place to save the earth, asking for flexible management system to integrate all therefore, delivering the need of agile management.

Keywords: green manufacturing, agile project management, lean principles.

1. Introduction

When it comes to manufacturing industries worldwide, efficiency with sustainability plays an important role to keep up in market along with competitors in businesses. For this, industries need to implement various basic to high level strategies in manufacturing through project management [1]. Along with the manufacturing operations, organizations deal with other aspects of an enterprise such as human resources, information technology, finance, upper management, and management in the projects according to the customer's demand to meet their satisfaction. Project management is a methodology comes with many powerful tools breaks into various phases and helps enterprises to deal with projects to complete successfully with step-by-step processes. If an organization use the model of green manufacturing with lean principles alongside, if implement agile project management for successfully completing the projects which gives birth to products/ services sustaining for long term will bolster protection of environment.

How lean manufacturing and management will support strong to green technology through agile project management? The answer hidden in the question, as lean process gives more with less. Reducing waste is the simple and easy one of the solutions put lights on the more from less.

Green manufacturing is not only about the use of renewable resources and bio- products in manufacturing environment but also, the use of existing processes wisely by reducing wastes and development of sustaining processes.

Manufacturing firms has taken lean manufacturing (LM) system as a great management tool in solving problems and many of them have adopted lean techniques in many different ways. The ultimate goal of a lean manufacturing is to develop a high-quality organization which can produce finished products concerning the customers demand with no waste [3].

In the observation that the standards of project management lack an explicit consideration of sustainable development principles and that “considering sustainable development as a context for projects, places new demands on project stakeholder management, especially when it comes to underpinning values” [2].

We are in the era, where everybody needs to try and act on clean manufacturing because of pollution and severe impacts on environment [1]. Low quality products, short term services, high production on short term service products which impact environment, non-flexible processes in manufacturing, less use of recycled material or resources available all are the problems can get mitigated through green manufacturing by use of lean principles through project management which would be a tailored methodology for such specific projects will surely empowers everybody to implement green, act green, produce green and make the environment green.

Energy is the most essential thing to ensure sustainable development and the forward ongoing approach of human civilization. For over the last three decades, the consumption of energy has doubled the rate it was back in the last century [7].

Another perspective of green manufacturing is creating electronics with the help of renewable resources, required for all purpose from software to manufacturing industry and also use of green products or raw materials to manufacture those electronics. There are MEMS (Micro- Electro Mechanical Systems) devices used as sensors in various applications from domestic appliances to automotive applications and in aviation industry too. If, tweaking silicon substrate for manufacturing MEMS, Bio-MEMS devices also an option for green environment [4], [8]-[11].

Application of micro-electro-mechanical system based piezoelectric actuation is increasing day by day in many applications— from compact electronic devices to industrial machineries. Designing and modeling of the micro-scale cantilever beam is, in many of the cases, a prerequisite for the optimized fabrication of micro-electro-mechanical system

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based piezoelectric actuators by electric, mechanical, biochemical, and electrophoretic methods, by means of piezo actuators and optical and acoustic tweezers [4], [11].

2. Basic Step towards Green World: Application of Lean Principles

Lean was identified at Toyota Production System (TPS) to eliminate or reduce waste or non-value-added activities in the manufacturing system.

It is also believed that application of Lean was implemented by Henry Ford at Ford Motors in 1920s. Lean is defined as by the National Institute of Standards and Technology Manufacturing (NISTM) Extension Partnership’s Lean Network [6]. A systematic approach to identifying and eliminating waste through continuous improvement, flowing the product and pull of the customer in pursuit of perfection [5].

It is a systematic approach for reducing different types of wastes which are constituting around 95% of the total waste. Important elements of TPS are shown in fig. 1.

TPS/Lean system is based on two major aspects:

- Elimination of Waste
- Respect for people.

Also, TPS based on three pillars, for manufacturing world, are:

- JIT
- Continuous improvement
- Jidoka

with fundamental blocks of standardization and stable processes for leveled production criteria.

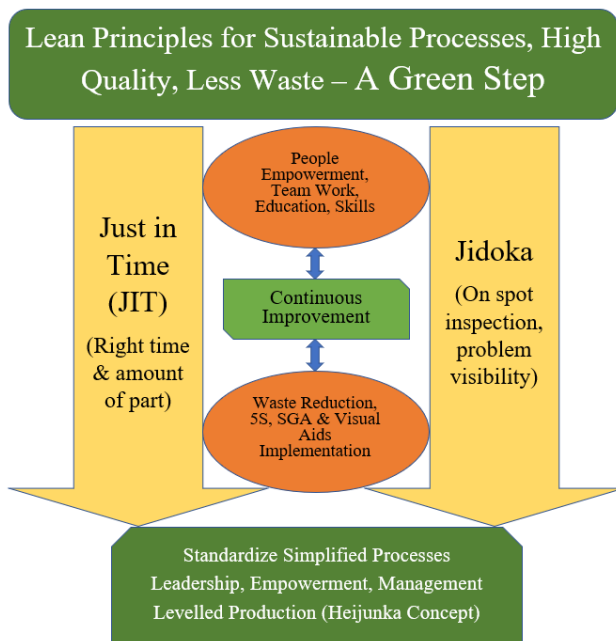


Fig. 1. TPS- Lean principles manufacturing flow

There are many types of wastes in manufacturing environment, some of the are listed as below and explained visually in fig. 2, 3, 4, 5, 6, 7, 8, 9, 10.

Nine (9) types of wastes are found usually in manufacturing

industries which are eventually leading to higher inefficiency in production and thus causing adverse effect on business and troubling the environment by creating different types of pollution.

1. Just watching the machine run



Fig. 2. Watching only – Idle sitting

2. Keep waiting on parts to come out



Fig. 3. Waiting on parts to come out

3. Manual/ After process parts counting



Fig. 4. Redundant counting

4. Useless/ over demand production



Fig. 5. Over production

5. Long distance parts hauling/ transit



Fig. 6. Long Transit- within industry

6. Inventory issues due excess production



Fig. 7. Full inventory- storage problem

7. Uneasy/ in accessible tool kit and look for it

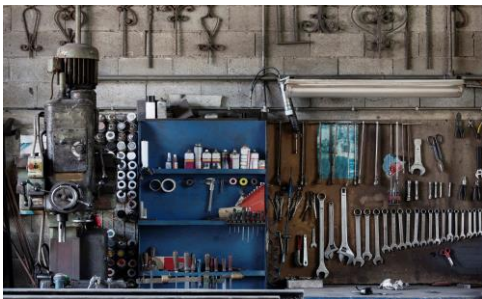


Fig. 8. Look for tools

8. Uneven/unexpected machine downtime due to lack of primitive/scheduled maintenance



Fig. 9. Machine breakdown

9. Bad machine causing bad parts resulting rework – waste of energy, sources, and time.



Fig. 10. Rework

All these wastes are minimizable and eventually reduceable. For these actions, needed steps are pretty self-explanatory and counter measures have implemented.

To lower the pollution, now it is important to make sustainable products through sustainable processes which will makes a huge impact and plays vital role to create green and clean environment, in long term benefits the businesses.

3. Glimpses of Lean Visual Aids for Waste Elimination

Lean production, which will be the first step towards green manufacturing, essential for protection of earth from pollution, can be categorized as follows and considered as huge contributory factor for the sustainable process development and its containment, shown in fig 11.

MUDA is Japanese term for waste reduction and eventually elimination from the process for manufacturing.

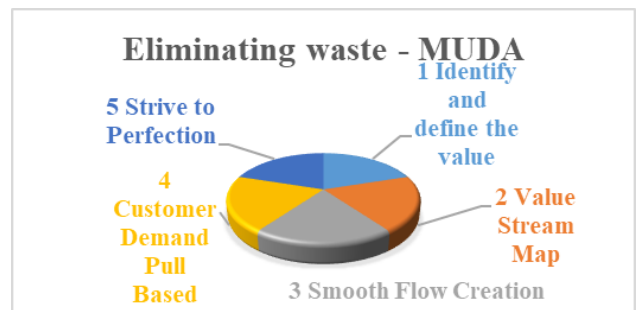


Fig. 11. Waste Elimination – MUDA Implementation

As this article research is not only limited to use of green products only to lower the pollution but also promotes the application of lean principles in manufacturing for the shop floor. Use of lean also helps to put a step towards the green culture.

So, for sustainability in the processes and consistent high quality, exceeding customers requirement by using limited sources (raw material) to its full extent means less waste is the motto of green environment in manufacturing which eventually causes less impact on earth getting polluted.

Hence, when there is containment of products and processes, sustainability and growth is there through few points discussed below.

- Training- Education to right resources for right caliber professional.

- Constant monitor, control and evaluation of organizational finances.
- Cross-functional individual's performance and analysis.
- Market Expansion.
- High level of management practices, accountability, organizational structure implementation.
- Proper streamlined new product development and its introduction to market.

4. Agile Environment through Project Management- Required for Better Efficiency in Green Approach

Traditional project management consists of five stages in project and product life cycle management and those are mostly based on highly use waterfall project management type.

- Initiation
- Planning
- Execution
- Monitor and Control
- Closure of the project

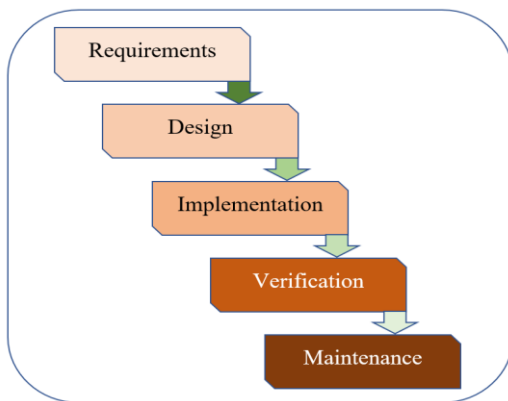


Fig. 12. Waterfall project management

Waterfall project management is useful in small and stable projects and have some restrictions for high level project which has tendency to play around means demanding flexibility.

In this type of project management methodology, planning is upfront and deeper documentation is involved, which may cause delay most of the time, and issues with hitting the deadlines for projects.

As such technique is used for smaller size projects, there will be direct contract negotiation takes place, without having different types of tricks used in project life cycle.

This agile methodology in project management allows us to develop a project in way with tailored management to carry on over the project. In another aspect, this methodology also uses organizational behavior of an organization through various modes of communication, through entire project life cycle management for effective communication and updates, because of continuous evolution in project management [12].

In agile technique, management cycle is continuous and consists of small teams. Small teams produce high efficiency and thus more collaborative. This management type has multiple methodology for tracking the project from

requirements to launch process. The approach in agile management permits continuous improvement more efficiently and evolution takes place constantly unlike in waterfall project management. While in closing stage of project, this methodology involves relevant customer inputs and thus, provides more clarity while project closure and future amendments through contracts.

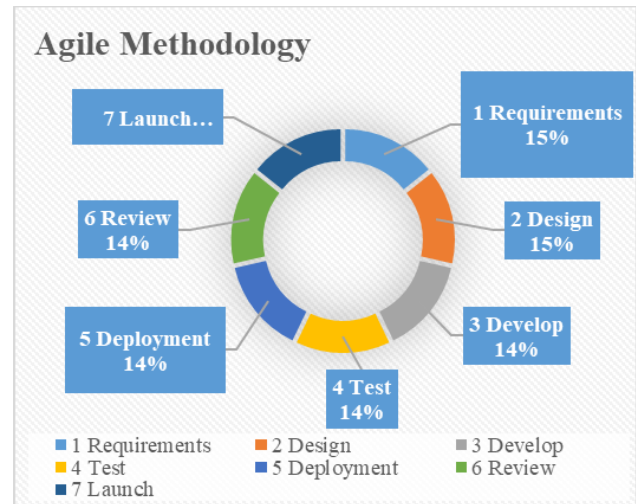


Fig. 13. Agile methodology in project management

5. Conclusion

To dilute the complicated nature of projects, custom designed project management is important to accomplish success in the project with sustainable product and its processes for long term to have Return on Investment at faster rate with development and improvement in the current business state and also to expand the business worldwide- reach out to more and more customers. Along with business case, now-a-days environment friendly products are preferred, more people are aware of pollution on the mother earth. So, research comes in to picture, showing application of lean and simultaneously an agile factor of project management in green manufacturing to achieve clean environment through sustainable products and processes.

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