

# Application of Lean Manufacturing Tools for Effective Maintenance of Academic Libraries

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**Abstract-** Lean manufacturing is a systematic continuous improvement methodology to improve the efficiency by decreasing the lead times and non value added activities. It is a perfection seeking technique that enables to deliver value and eliminates wastes. The prime focus of lean is to eliminate the non value added activities. An effective library focuses on providing its readers a hassle free search process and to make the delivery service chain smooth without delays. By reducing the operating lead times, lean management principles allow a library to provide effective service with more flexibility in its delivery system. To establish a lean library, the organization must undergo minor changes to its operational process such that the non value added activities are being removed. This article focuses on creating a library incorporated with lean management principles for providing effective operational service. A segregation of value adding and non value adding activities is also performed based on a library perspective. This article also provides an insight on how different lean tools can be applied to a library and how the tools would help to minimize the non value added activities.

**Keywords –** Lean library, 7 wastes, Effective Inventory Management

## I. INTRODUCTION

Lean manufacturing is derived from the Toyota Production System as developed by Taiichi Ohno, Shigeo Shingo and others over a forty year period (Shah and Ward, 2003; Pavnaskar et al., 2003; Yadav et al., 2020). It began with efforts to reduce die change time on the stamping press which then allowed for a reduction of in-process inventory and this became just-in-time inventory management (Yang et al. 2011; Kamble et al., 2020). This resulted in the need for less warehouse space, fewer forklifts, unnecessary space, etc. Once the flow of work can be interruption free, free of materials sitting, standing, and redo-loops, waste is eliminated. Lean is the elimination of waste. But, more importantly, lean is continuous improvement in all work processes. Here are some ways of describing lean philosophy or culture (Bhasin and Burcher, 2006):

- Lean is a culture of continuous improvement practiced at every level of the organization and by every team.
- Lean is the elimination of waste in all its forms. Lean is the ability to distinguish between work that actually adds value to your customers and work that does not. By eliminating waste, you free resources to devote to value-adding activity that serves your customers.

The Lean manufacturing techniques is being used to streamline manufacturing, distribution, and retail can be applied to the library environment (Salah et al., 2010; Xiao 2020). These strategies were time-tested in successful companies such These real-life examples are used to clarify specific points. Lean manufacturing can also be applied to manage academic libraries in order to provide better service with improved value (Murphy 2009; Alvim et al., 2020). Recognize that service performance is the key to customer retention. The main challenge lies in improving

the delivery service chains and to improve the overall library service performance metrics. Lean management helps in achieving this state and helps in transforming the delivery service chain from a “push” to a “pull” philosophy. This is achieved by following a five step principle process. The principles are:

1. Specify value from the standpoint of the end customer by product family.
2. Identify all the steps in the value stream for each product family, eliminating whenever possible those steps that do not create value.
3. Make the value-creating steps occur in tight sequence so the product will flow smoothly toward the customer.
4. As flow is introduced, let customers pull value from the next upstream activity.
5. As value is specified, value streams are identified, wasted steps are removed, and flow and pull are introduced, begin the process again and continue it until a state of perfection is reached in which perfect value is created with no waste. Some of the benefits that can be attained while successfully deploying lean are shown below:
  - Creating a more intelligent business process that focuses on establishing a pull system that ensures work is only carried out when there is an actual demand and need for it.
  - Effective management of resources to ensure that the organization is only using resources when they are needed since it operates based on real customer demand.
  - Improved focus by minimizing the amount of wasteful activities, therefore allowing the workforce to increase their focus on tasks that produce value.
  - Enhanced productivity and efficiency that leads to a more productive and efficient workforce since attention is not given to unnecessary activities.

This research article explains about the effective deployment of lean manufacturing principles in libraries to improve its service. The article also details about the list of wasteful activities that can be found in libraries and also recommends a list of lean tools to be deployed to minimize such wasteful activities.

II. TRACKING OF NONVALUE ADDED ACTIVITIES

2.1 Non Value Added Activities in a library –

Waste can be defined as any activity that utilizes resources and does not add any value for the customer. Since these wastes add to the cost of products, they either reduce the profit or inflate the price that the customer needs to pay. In general, customers are not willing to pay for these activities because they do not benefit from them. Therefore, eliminating waste presents a great opportunity for businesses to cut costs and improve efficiency. Lean philosophy has identified seven wastes. These include: transportation, inventory, motion, waiting, over processing, overproduction, and defects. Elimination of these seven kinds of waste can help companies reduce costs, increase employee engagement and customer happiness, and increase profits. The lean management and continuous improvement philosophy (Kaizen) attempt to decrease as much waste as possible. Table 1 shows the categories of lean wastes.

Table -1 Category of Lean Wastes

Waste Category	Example	Remedial Action
Transportation	Movement of materials from one location to another	Avoid unnecessary steps in between processes
Inventory	Every piece of product tied up in raw material, work in progress or finished good costs money until its sold	Do not store extra materials
Motion	Unnecessary motions are movements of machines or employees that are not as small or as easy to achieve as possible	Make the motions in between processes easier
Waiting	Any idle time produced when two interdependent processes are not completely synchronized	Connect processes well, so no time is wasted
Over Processing	Put more into the product than is valued by the customer	Do not do more than what customers want
Over Production	Results from producing more or faster than required	Do not produce more than what customers need
Defects	Errors that require time to fix	Avoid mistakes or the production of bad quality goods

Some of the common types of waste or non value added activities that can be found in academic libraries are discussed in Table 2 .

Table-2. Non value added activities that can be found in academic libraries

Waste	Activity
Defects or Poor Quality	<ul style="list-style-type: none"> <li>• Equipment not performing well</li> <li>• Catalogue not accurately showing what we own</li> </ul>
Waiting	<ul style="list-style-type: none"> <li>• Staff waits for needed materials</li> <li>• Staff waiting to resolve bottlenecks</li> </ul>
Motion	<ul style="list-style-type: none"> <li>• Excess filing</li> <li>• Moving paper from place to place</li> <li>• Moving people or items more than necessary</li> </ul>
Over processing	<ul style="list-style-type: none"> <li>• Unnecessary paper or forms</li> <li>• Redundant steps</li> <li>• Inefficient processes</li> </ul>
Transportation	<ul style="list-style-type: none"> <li>• Improper placement of counters</li> <li>• Entry and deliver point of books are located at far distance</li> </ul>
Inventory	<ul style="list-style-type: none"> <li>• Availability of multiple copies that are not popularly read</li> <li>• Larger waiting time for book placement in racks</li> </ul>

Some of the lean tools that can be applied in library to eliminate the non value added activities are shown in table 3:

Table - 3: Lean tools that can be applied in library to eliminate the non value added activities

Waste	Activity
5S	5S more emphasis on the process of how to cultivate a workplace that is orderly and clean. Just like other office, library is a workplace where officer (called library) do the library activities. 5S helps the office activities quicker than usual
Kaizen	Incremental improvement actions are planned considering the need of the library such that the possibilities of delays are less
Facility Layout	Facilities in a library must be well planned and arranged in a layout such a manner that the objective of increase in productivity and efficiency of library operations achieved. A simplified framework for the application of systematic layout planning for the design of library facility layout is proposed by making enough modifications in the basic approach.
Value stream mapping	The operational flow of processes can be made as a value stream to identify the value adding and non value adding activities in a library and to minimize the bottlenecks
Kanban Cards	The issue and replenishment cards can be made as kanban cards in order to track the books effectively and also to minimize the case of lost books
Visual Boards	Visual boards helps in minimizing the search time and provides effective guidance

The above mentioned lean tools helps in minimizing the non value added activities of a library. Apart from the discussed tools, there are various other lean tools such as Poka Yoke, SMED etc. Which would also guide in effective reduction of non value added activities. Implementing the lean tools helps in creating an organized workplace with minimal non value added activities. Some of the advantages that can be experienced while deploying the strategy in libraries include:

- Creating a cultural change
- Redefine and streamlining the service delivery chains of the libraries
- Transforming the traditional processes that consumes time into value added processes
- Experiencing continuous improvement in service and delivery chains
- Effective handling of stocks and details of transactions

#### IV.CONCLUSION

Lean manufacturing is an approach to manage an organization that supports the concept of continuous improvement which is a long-term approach to work that systematically seeks to achieve small, incremental changes in processes in order to improve efficiency and quality. The primary purpose of lean management is to produce value for the customer through the optimization of resources and create a steady workflow based on real customer demands. It seeks to eliminate any waste of time, effort or money by identifying each step in a business process and then revising or cutting out steps that do not create value. Non value added activities minimizes the efficiency of an organization and declines its progress. Applying lean concepts to libraries helps in streamlining its processes and helps in providing better service and customer satisfaction. Some of the benefits that can be experienced after applying lean tools in a library are:

- Sets up clear targets and procedures to assess progress
- Documents all the processes in detail and tracks the non value added activities
- Eliminates “work-around” by providing solutions to problems at its root cause
- Improvises the work culture
- Reduces barriers between staff and librarians
- Encourages staff to think differently about the work they do
- Empowers staff at all levels to address problems and to provide effective solutions

By applying lean manufacturing principles, library management would become more efficient and always provides a chance to pursue perfection. Though lean as a philosophy can be applied to all service domains, application in academic libraries would provide scope for finding the non value added activities and would create path for finding innovative solutions for the betterment of the organization.

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