

# Methodology to Enhance Warehouse Performances using Lean Concepts

Uthpalee Hewage

University of Moratuwa, Sri Lanka

## 1. Introduction

Lean principles and continuous improvement strategies such as six sigma, Value Stream Mapping, standard work and 5S can be used as major tools to reduce non-value adding activities and to optimise the overall performance in the supply chain of an organisation. Although the concept originated in manufacturing industry (Toyota), its basics can also be successfully applied to service industry, and one such promising industry is warehousing.

Warehousing plays a crucial role in supply chain management in an organisation, where the activity, most of the time, involves only in managing the movement of goods efficiently according to customer requirements, but not in owning the good. Thus handling the goods movement efficiently leads to good profit. Lean application in a warehouse can improve its visibility, material flow, work organisation and standardisation of processes. Here, according to the problem area and counteraction of the company, this study turns to the problems of improvement of efficiency and value adding through the implementation of lean principles in the warehouse [1].

The study focused first on identifying the possibility of applying Lean Concept into warehouse operation. Secondly, it aimed to develop a methodology to identify Non-Value Adding Activities (NVAAs) in the system using Lean tools and then to determine suitable Lean tools to mitigate or remove those NVAAs from the system, hence enhancing the performance of the warehouse operation. Due to the time and finance constraints, research was conducted in a way which included the features of the case study approach.

## 2. Methodology

First objective of the study was attained through a thorough literature survey which proved that basic concept of Lean could successfully be implemented in warehousing industry. Here, due to financial and time constraints, Case study method [2] was selected to achieve the objectives of the research by taking a single warehouse for the sample containing all the essential and standard characteristics and qualities of a typical warehouse. This approach made it possible to conduct the research within the given timeline and within the available limited financial

resources. Next, a thorough work study was carried out followed by a time study, in order to understand the current operations procedures of the warehouse. To achieve the second objective, basic Lean principles [3] were applied into the warehouse operation procedure in the below mentioned order: Firstly, Value Adding Activities (VAAs) and Non-Value Adding Activities (NVAAs) were identified through an analysis of the current scenario which was carried out with the data collected from the work study, interviews with management and every level of the operational staff, KPI performance reports, using Lean tools like standardised work (Standard Operation Procedures preparation-SOPs), regression analysis and fish bone analysis in the selected FMCG warehouse containing the standard features of a typical warehouse scenario. Secondly, using all these data, a value stream map was developed to visualise the current scenario. Thirdly, after identifying NVAAs in the process, recommendations were made to mitigate or reduce the effects of NVAAs to the process while enhancing the overall performances.

### 3. Research Findings

**Table 1: Non Value Adding Activities in the System**

Category	NVAAs
Over Production	Poorly predicted forecasting plan (difference of 14%, actual vs. predicted and 11.65% difference in manpower planning)
Waiting	Supplier arrival delays (23.81%), KPI manually generating (1.25 hrs. of supervisors' time), Long time to pick tasks (28% of the Operation), MHE handling delays (22 min daily), Longer approval process
Unnecessary Transport	Higher outlet returns (average Rs 3792742.645 worth goods per month)
Over Processing	Complex Return process
Excess Inventory	Return stocks stored within the facility
Unnecessary Motion	Return process, Higher on demand replenishment tasks, Increased pick overrides (increased by 8.5 per line)
Defects	Increasing DC damages (34.57% than allowed limit value)
Unused employee creativity	High employee turnover (4.6%), Misused work force resources in repacking department, New recruits reducing the pick rates

With identified NVAAs or wastages in the system (Table 1, above) as the outcome of the study, a methodology or a framework was proposed such that the operation could reduce its Lead time by 12 hours (Table2, below).

**Table 2: Recommendations to Optimize the Warehouse Performances with the Respective Lean Tool**

<b>Recommendation</b>	<b>Lean Tool in use</b>
Proper resource allocation system with More accurate demand predictions done by the Warehouse Management	Heijunka/ Demand Leveling and Capacity Planning
Reducing the number of late suppliers and absent suppliers using a fine system, strict slot allocation procedure and mandatory confirmation of their arrival	KPI and Work Simplification
Common frame work to generate KPI reports within all departments in the warehouse	Automation
More focus on employee performance development programmes	Root cause analysis and Team Development
Encouraging dynamic replenishment over on demand replenishment using flexible work hours so when the picking starts all the pick faces have 100% capacity.	Work Balancing
Generating MHE tasks separately in picking so that all the high racks tasks can be done within a short period of time without pallets being kept in aisles for a long time	Work Balancing
Getting the approval to change Master data in the system so that receiving process can be speed up by eliminating the time wasted waiting until the mother company changes it every time	Work Simplification
Modifying the return process in such a way that suppliers or delivery vehicles do not have to waste time by travelling several time to the return department but getting the relevant return stock at the receiving bay or dispatching bay respectively	Work Balancing, Cellular Manufacturing and Work Simplification
Reducing the storage time of returns with the strict KPIs for suppliers and customer	KPI
Reduce damaged within the facility with the use of strict KPI parameters for both employees and suppliers	KPI
Using GPS to add more efficiency to the Fleet management process	Automation
Develop and maintain employees' positive attitude towards the operation system with Lean tools	5S, Kanban, Six Sigma
Reducing the Lead time in the operation	Due to above all tools

As the final step of seeking perfection, continuous improvement tools are embedded in these recommendations, ensuring the sustainability of the performance enhancements in the operation, and providing a methodology to be followed in order to enhance performance in warehousing using Lean Concept.

## References

1. Phogat, S., 2013. An Introduction to applicability of Lean in Warehousing. International Journal of Latest Research in Science and Technology, 2(5), pp. 105-109
2. Reen J, Thorgood N, 2009. Qualitative methods for health research. 2 ed. Los Angeles: Sage
3. Garcia, F. C., 2013. Applying Lean concepts in a Warehouse Operation. Business Solutions & engineering Services

**Keywords:** *Lean Principles, Case study method, SOPs, Lean Tools, Lean wastages, VAAs and NVAAs*