WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

"Lean Manufacturing Implementation to Reduce Waste"

MR. AVINASH KUMAR[1],HARSH SINGH [2]

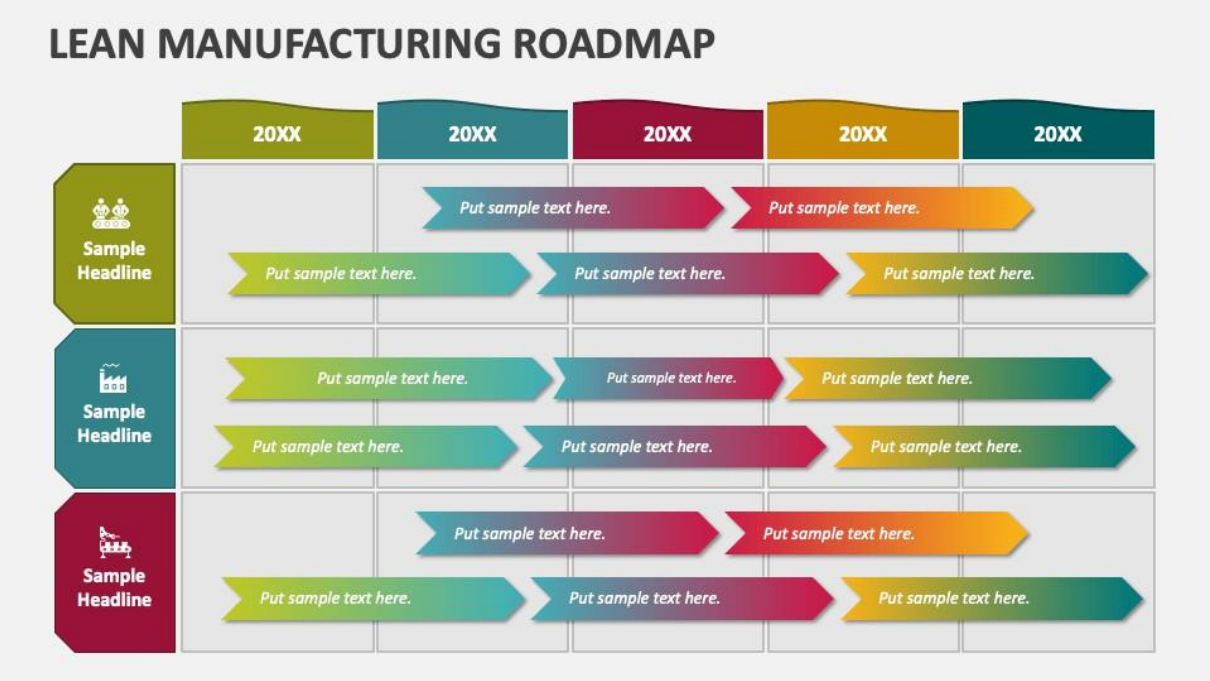
UNDER THE GUIDANCE OF
22GSOB1010750
School of Business
PlotNo.2,Yamuna Expy,oppositeBuddhaInternationalCircuit, Sector 17A, Greater Noida, Uttar Pradesh 203201

ABSTRACT :

The manufacturing industry plays a crucial role in the economy development of a country includes Malaysia. Lean manufacturing is a production method that aims to minimize waste and optimize efficiency in the manufacturing process. By applying lean manufacturing, it enables a company to pursues continuous improvement and integration of labor with a clear focus on value adding activities and elimination of waste. However, this concept is still not widely being applied by all type of company or limited in certain aspects only. This study aims to implement lean concept into a medium sized electronic company in Malaysia named as Company ABC, particularly to improve the efficiency of the production line. Company ABC is expanding its production line, thus looking forward to implement 8 Waste and VSM to improve the Line Balancing Rate and improve the line productivity from 1500 units/ week to 3000 units / week. The clarifications lead to this study is to understand, how the Implementation of Lean Manufacturing can help to improve the production line efficiency, what are the factors that causes producibility issues during design development stage and what are the area of improvement of the manufacturing line of Model X that could be enhanced and applied in this particular project. The goal of this study is to assess the contribution of Lean six sigma in the company to increase the process line productivity and maximize the efficiency of the production process. A model was developed to simulate the efficiency improvement of the production line after application of Lean Manufacturing.

Introduction

Lean Manufacturing is a systematic approach aimed at improving efficiency by eliminating waste in production processes. It originated from the Toyota Production System (TPS) and has been adopted worldwide. Waste in manufacturing includes excess production, waiting time, unnecessary transport, over-processing, excess inventory, and defects. The adoption of Lean practices ensures increased productivity, reduced costs, and enhanced customer satisfaction The primary goal of Lean Manufacturing is to create a streamlined, cost- effective, and highly efficient production system that not only reduces operational costs but also improves customer satisfaction and business profitability. By applying Lean principles such as 5S, Kaizen, Kanban, Value Stream Mapping (VSM), and Justin-Time (JIT) production, companies can achieve significant improvements in their operations.
This study explores the implementation of Lean Manufacturing techniques and their impact on reducing waste and improving overall productivity in industrial settings.
The basic idea with lean manufacturing is to use less of the whole thing in contrast to mass production, less human effort, engineering hours, space in the manufacturing facility, and so on, which requires less stock and defects to succeed. Lean refers to principles and strategies that focal point on the systematic identification and removal of non-value-added activity involved in producing a product or providing service to the customer. The author argues that though the success of lean has been established in the manufacturing world, there are nevertheless some challenges to face on the lean implementation process . Challenging to ask employees to exchange their way of wondering to focus on value preferred by way of the purchaser and discover waste. The definition of lean manufacturing and how it coincides with the Toyota Production System (TPS) are now not usually regular when reading current research and it has changed over time. The author argues that there are several special definitions to lean manufacturing, leading to confusion of what is protected by means of the concept . Lean manufacturing thought used to be developed for maximizing the useful resource utilization via minimization of waste, later on, lean was



formulated in response to the fluctuating and aggressive enterprise environment. Due to a rapidly altering business environment, agencies are pressured to face challenges and complexities. Any organization whether manufacturing or service-oriented to survive may additionally in the end depend on its potential to systematically and consistently reply to these changes for improving the product value. Lean is not just linked to machines in the production; all the production assets of the business enterprise are included, for example, personnel, capital, and energy. Today the lean concept is used in many different areas concerning up- grades and the original meaning of the concept might also have lost its meaning.

In this study, a contract based company is selected. Contract manufacturing is a type of manufacturing in which a company outsources the production of certain components or products to another company. The company that provides the manufacturing services is known as the contract manufacturer, while the company that contracts the work out is known as the original equipment manufacturer (OEM). Contract manufacturing can be used to produce a wide range of products, including electronics, automotive parts, medical devices, and consumer goods. A successful CM often adopt few methodologies in the production line that are Six Sigma method and Lean Manufacturing to improve the quality and the line efficiency for maximized output and revenue. The research of this paper will concentrate more on applying a few principles from lean such as VSM and 8 Waste to improve the Line Balancing Rate and improving the Operator Utilization Rate thus increasing the output of the line. The objectives of this paper will be to assess the contributions of Lean six sigma to process line

production lines leads to inefficiencies that impact profitability. By implementing Lean principles like Just-In-Time (JIT), Value Stream Mapping, and Kaizen, businesses can enhance workflow and reduce waste. Lean manufacturing provides a structured approach to identifying and eliminating waste, improving efficiency, and enhancing overall productivity. By implementing lean principles, companies can streamline their production processes, reduce unnecessary resource consumption, and minimize delays. This leads to lower operational costs, higher product quality, and better customer satisfaction.

Moreover, reducing waste is crucial for environmental sustainability. Industrial waste contributes significantly to pollution and resource depletion, making it essential for manufacturers to adopt sustainable practices. Lean manufacturing aligns with sustainability goals by promoting efficient resource utilization, reducing excess materials, and improving energy efficiency.

Another key reason for this study is the impact of lean methodologies on workplace productivity and employee engagement. Tools such as 5S, Kaizen, and Just-in-Time help create a more organized and efficient work environment, leading to increased worker motivation and continuous improvement in processes.

Literature Review

Numerous studies have validated the impact of Lean Manufacturing on operational efficiency: - **Womack & Jones (1996)** introduced Lean Thinking principles, emphasizing waste reduction. - **Shah & Ward (2003)** highlighted the significance of Lean tools such as 5S, Kanban, and TPM. - **Case Study: Toyota** - Toyota's success in Lean implementation reduced lead time by 50% and cutinventory costs significantly. Key Lean tools such as Value Stream

Mapping (VSM), 5S, Kaizen, Kanban, and Poka-Yoke are widely used to streamline operations and eliminate inefficiencies (Womack & Jones, 1996; Rother & Shook, 1999). Studies have shown that these tools can significantly reduce cycle times, inventory levels, and defect rates in various industries, including automotive, textiles, food processing, and healthcare (Seth & Gupta, 2005; Amin & Karim, 2013).

However, successful implementation requires more than tools—it demands cultural change, management support, and employee involvement (Bhasin, 2012). Integrating Lean with digital technologies and sustainability practices is emerging as a modern trend to further enhance waste reductionIn summary, Lean Manufacturing remains a proven and adaptable strategy for minimizing waste, improving productivity, and fostering continuous improvement in diverse manufacturing settings.

Research Objectives

- Identify Waste in Manufacturing Processes
- Understand the different types of waste (e.g., overproduction, waiting time, defects, excess inventory) in the current system.
- Analyze how waste affects productivity and costs.

Implement Lean Manufacturing Techniques

Methodology

The 8 Waste Methodology In lean manufacturing, waste is defined as any activity or process that does not add value for the customer.
There are eight types of waste that are commonly identified in manufacturing environments, known as the "8 Wastes These are ;

- Overproduction: Producing more than is needed or producing before it is needed.
- Waiting: Time spent waiting for materials, equipment, or instructions.
- Defects: Errors or mistakes that require rework or scrap.
- Excess inventory: Having more raw materials, work-in-progress, or finished goods than necessary.
- Unnecessary motion: Extra movement or handling of materials that does not add value.
- Unnecessary processing: Performing unnecessary steps or using unnecessary equipment in the production process.
- Unused talent: Underutilizing the skills and expertise of employees.
- Transport: Moving materials or products unnecessarily or inefficiently.

In this study, identifying and eliminating these wastes is a key aspect of lean manufacturing, as it helps to reduce costs, improve efficiency, and increase customer satisfaction (refer Table 1 below). To identify waste, manufacturers can use tools such as value stream mapping and kaizen events, which involve bringing together cross- functional teams to analyze and improve processes. Once waste has been identified, it can be eliminated through a variety of methods, such as automating processes, standardizing work, implementing pull systems, and using poka-yoke (error-proofing) devices. By reducing or eliminating these wastes, manufacturers can improve
the efficiency of their production processes and produce high quality products with minimal waste.

Methodology Improvements applied in Manufacturing Line Transportation Inventory Motion Waiting Overprocessing Overproduction Defects Skills Reduction of MES manual scanning and introduce auto scanning method to reduce manual scan time by operators Implementation of AGV units to move the materials from Kitting to Production Floor. Remove all the in-process kanban in the station to remove WIP buildup Increase the capacity of trolleys to hold larger quantity of materials Introduce inline curing station for 30mins to eliminate operator handling and movement to move the units to the curing trolley Improve the machine movement speed to improve CT to prevent adding additional machine Improve the Line Balancing rate of the production line from 46% to 80% to reduce operator waiting time No Improvement done Improve the line to be in Single Piece Flow to prevent WIP accumulation and remove all the trolleys in the production floor. No Improvement DONE.

CONCLUSION

Lean manufacturing has a foundation that has revolutionized the way products and services are provided to customers throughout the world. Focus on waste elimination and process improvements have become very popular since their introduction in the early twentieth century, spreading from the "Eastern" manufacturers such as Toyota to the "Western" manufacturers such as Ford, General Motors and Chrysler. As provided, these practices are not limited to any specific service or product and many approaches can be combined in various applications to become even more successful. Key methods of lean manufacturing have been discussed that lay the framework for a superior approach geared to reduce waste and improve processes. Value Stream Mapping was listed as the ideal tool for a lean organization to map the entire value stream while identifying the customers' requirements. This development allowed for process design improvements and additional waste reductions. Just-in-Time production was recognized as an integrated lean method that streamlined processes while reducing batch size. JIT reduces the need for excess inventory and provided the appropriate amount of product just in time as desired by the customer. Lean Six Sigma is outlined as the lean statistical methodology used to reduce variation while improving the quality of the product or service. Methods within Six Sigma included the DMAIC process which are identified in the holistic approach to address a specific issue within a procedure and bring it back into control with the use of statistical and process monitoring tools. Kaizen was discussed as the lean method of continuous improvement through the usage of building the workforce in conjunction with training to address smaller incremental issues that tend to arise. Teams of employees and key leaders throughout the organization take place in kaizen events to focus on continual improvement practices. Total Productive Maintenance (TPM) was identified as a holistic approach of an organization to train LEAN MANUFACTURING: APPROACHES TO REDUCING WASTE 57 employees and identify areas of improvement through maintenance practices. TPM proved to be valuable in reducing defects and nearly eliminating machine downtime in assembly line processes to further streamline the lean manufacturing approach. Ending discussions, the importance of culture relating to the implementation and success of a lean organization was held. Here the evidence was provided that management and the roles of the workforce alike are both extremely valuable in continuous improvement efforts when cultivating a lean environment. . If management does not convey the vision of lean across the organization and include the workforce in decision-making and problem-solving activities, lean methodologies will likely be hindered. All of the listed lean methods support the improvements that are to be harnessed
through the application of lean manufacturing which is specifically created to reduce waste, improve efficiencies, create an environment of continuous improvement, reduction of overhead costs and improved customer satisfaction. This results in a superior manufacturing philosophy that will give organizations the competitive advantage needed to be successful in the ever-evolving market of the twenty-first century. Due to the dynamic nature of manufacturing and the growing need to reduce overhead costs, it is vital for organizations to take a lean approach if at all means possible

4. RESULTS AND DISCUSSIONS

We used Google form to create and store the survey. This enabled us to provide an online survey link to potential respondents. Initial emails
were sent to 500 Indian industries. In the email, a general description of the research project, its purpose, and the URL link to the survey was
provided. Follow-up emails were sent to these target industries after 2 weeks to remind the respondents to finish the questionnaire. Finally, a total of 92 responses were obtained. As a result, the response rate was
18.4 %. Out of 92 respondents 59 (64%) answered that they are familiar with concept of lean manufacturing. 33 (36%) respondents denied that they are familiar with lean manufacturing. When explained the concept of lean manufacturing and then asked if they think lean practices are useful 71 (77%) respondents replied that they think lean is useful for manufacturing industries in India. However, 21 (23%) respondents
denied that lean is useful. To identify the important reasons of
implementing and not implementing lean in Indian industries, a scale containing eight items was developed after a comprehensive literature review. Respondents were asked to rate the reasons of implementing lean on a five point Likert scale. The rankings of reasons of
implementing and not implementing lean are shown in table 2 and 3 respectively.

REFERENCES

1. Ahmad, S. A. S. (2013). Culture and lean manufacturing: towards a holistic framework. Ahuja, I.P.S. and Khamba, J.S. (2008), "Total productive maintenance: literature review and directions", International Journal of Quality & Reliability Management, Vol. 25 No. 7, pp. 709-756.. Angelis, J., Conti, R., Cooper, C., Gill, C. (2011),"Building a high- commitment lean culture", Journal of Manufacturing Technology Management, Vol. 22 Iss: 5 pp. 569 - 586 http://dx.doi.org/10.1108/17410381111134446 Anholon, R., & Sano, A. T. (2016). Analysis of critical processes in the implementation of lean manufacturing projects using project management guidelines. The International Journal of Advanced Manufacturing Technology, 84(9), 2247-2256. Ansari, A., & Modarress,
2. B. (1986). Just-in-time purchasing: problems and solutions. Journal of purchasing and materials management, 22(2), 11-15. Begam, M., Sekkizhar, J., & Swamynathan, R. (2014). A brief overview of current trend of lean management practices in manufacturing industries. Annals of the Faculty of Engineering Hunedoara - International Journal of Engineering, 12(2). 35-42. Retrieved from Hunedoara http://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=0&sid=b991cef7-f51f- 439fa7ba-40c45bed4118%40sessionmgr4010 Brady, J. E., & Allen, T. T. (2006). Six Sigma literature: a review and agenda for future research. Quality and reliability engineering International, 22(3), 335-367. LEAN MANUFACTURING: APPROACHES TO REDUCING WASTE 59 Brah, S. A., & Chong, W. K. (2004).

3. Relationship between total productive maintenance and performance. International Journal of Production Research, 42(12), 2383-2401. Chandrasekar, M., Murugesan V.M., & Rajenthirakumar, D. (2016). Manufacturing process improvement using lean tools. Annals of the Faculty of Engineering Hunedoara: International Journal of Engineering, 14(2), 151-154. Retrieved from http://web.b.ebscohost.com/ehost/detail/detail?vid=0&sid=f28c2627-ca5f-4e87- ad0baec71b793da1%40pdc-sessmgr04&bdata=JnNpdGU9ZWhvc3QtbGl2 ZSZzY29wZ T1zaXRl#AN=115816507&db=a9h Chiarini, A. (2011). Japanese total quality control, TQM, Deming's system of profound knowledge, BPR, Lean and Six Sigma: Comparison and discussion. International journal of lean six sigma. Čiarnienė, R., & Vienažindienė, M. (2012). Lean manufacturing: theory and practice. Economics and management, 17(2), 726-732. De Mast, J., & Lokkerbol, J. (2012). An analysis of the Six Sigma DMAIC method from the perspective of problem solving. International Journal of Production Economics, 139(2), 604-614. Guner Goren, H. (2017). Value stream mapping and simulation for lean manufacturing: A case study in furniture industry. Pamukkale University Journal of Engineering Sciences, 23(4). 462-469. Retrieved from http://web.a.ebscohost.com/ehost/pdfviewer/pdfvie wer?vid=0&sid=76c89cb6-ec74-4f3a-94b4-cefaad48e2d6%40sessionmgr4008 Haider,
4. A., & Mirza, J. (2015). An implementation of lean scheduling in a job shop environment. Advances in Production Engineering & Management, 10(1). 5-17. Retrieved from LEAN MANUFACTURING: APPROACHES TO REDUCING WASTE 60
5. http://web.b.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=14&sid=8155dbf6-64b3- 4ae9-88ff-060819bb94cb%40pdc-v-sessmgr03 Hassan, K., & Kajiwara, H. (2013). Application of Pull Concept-based Lean Production System in the Ship Building Industry. Journal of Ship Production & Design, 29(3). 105-116. Retrieved from http://web.b.ebscohost.com/ehost/pdfviewer/pdfviewer ?vid=0&sid=e77 c5a90-5cba- 4882-91f8-4a5f45cd9860%40pdc-v-sessmgr01 Iuga, Maria & Kifor, Claudiu. (2013). Lean manufacturing: The when, the where, the who. Land Forces Academy Review. 18. 404-410. Jain, A., Bhatti, R., & Singh, H. (2014). Total productive maintenance (TPM) implementation practice: a literature review and directions. International Journal of Lean Six Sigma Jones, C., Medlen, N., Merlo, C., Robertson, M., & Shepherdson, J. (1999). The lean enterprise. BT Technology Journal, 17(4), 15-22. Krishnan, B. R., & Prasath, K. A. (2013). Six Sigma concept and DMAIC implementation. International Journal of Business, Management & Research (IJBMR), 3(2), 111-114. Leitner, P. A. P.
6. D. (2005). The lean journey at the Boeing Company. In ASQ World Conference on Quality and Improvement Proceedings (Vol. 59, pp. 263-271). American Society for Quality. Ortiz, C. (2006). All-out kaizen: A continuous improvement plan delivers change to the production floor... and dollars to the bottom line. Industrial Engineer, 38(4), 30-35. Mehta, D., Mehta, N., & Mehta R. (2012). Lean manufacturing practices: Problems and prospects. Annals of the Faculty of Engineering Hunedoara - International Journal of Engineering, 10(3). 119-124. Retrieved from http://web.b.ebscohost.com/ehost LEAN MANUFACTURING: APPROACHES TO REDUCING WASTE 61 Mehta, M. (2019). Bring Six Sigma quality into your lean processes. ISE: Jones, C., Medlen, N., Merlo, C., Robertson, M., & Shepherdson, J. (1999). The lean enterprise. BT Technology Journal, 17(4), 15-22. Krishnan, B. R., & Prasath, K. A. (2013). Six Sigma concept and DMAIC implementation. International Journal of Business, Management & Research (IJBMR), 3(2), 111-114. Leitner, P. A. P.
7. D. (2005). The lean journey at the Boeing Company. In ASQ World Conference on Quality and Improvement Proceedings (Vol. 59, pp. 263-271). American Society for Quality. Ortiz, C. (2006). All-out kaizen: A continuous improvement plan delivers change to the production floor... and dollars to the bottom line. Industrial Engineer, 38(4), 30-35. Mehta, D., Mehta, N., & Mehta R. (2012). Lean manufacturing practices: Problems and prospects. Annals of the Faculty of Engineering Hunedoara - International Journal of Engineering, 10(3). 119-124. Retrieved from http://web.b.ebscohost.com/ehost LEAN MANUFACTURING: APPROACHES TO REDUCING WASTE 61 Mehta, M. (2019). Bring Six Sigma quality into your lean processes. ISE: Pampanelli, A. B., Found, P., & Bernardes, A. M. (2011, April). A lean
8. and green Kaizen model. In POMS annual conference, Reno, Nevada, USA (Vol. 29). Pepper, M. P., & Spedding, T. A. (2008). The evolution of lean six sigma. LEAN MANUFACTURING: APPROACHES TO REDUCING WASTE 62 Prošić, S. (2011).
9. Kaizen management philosophy. In I International Symposium Engineering Management And Competitiveness, June (pp. 24-25). Shirose, K. (1995), TPM Team Guide, Productivity Press, Portland, OR. Tang, L. C., Goh, T. N., Lam, S. W., & Zhang,
10. C. W. (2007). Fortification of Six Sigma: expanding the DMAIC toolset. Quality and Reliability Engineering International, 23(1), 3-18. Taylor, J., Sinn, J., Ulmer, J. M., & Badar, M. A. (2015). Proposed progression of lean six sigma. Journal of Technology Studies, 41(1), 2-8. Tenera, A., & Pinto, L. C. (2014). A Lean Six Sigma (LSS) project management improvement model. Procedia-Social and Behavioral Sciences, 119, 912- 920. Towill, D. (2006). Handshakes around the world [Toyota production system]. Manufacturing Engineer, 85(1), 20-25. Vasile, C., &Virginia, M. (2013). Lean manufacturing: The when, the where, the who. Revista Academiei Fortelor Terestre,
11. 18(4). 404-410. Retrieved from http://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=0&sid=095fab89-cc99- 4a42- ad77-e73b977be2ee%40sdc-v-sessmgr04 Van Der Merwe, K., Van Dyk, L., & Coetzee, R. (2013). Lean implementation strategies: How are the Toyota Way principles addressed. South African Journal of Industrial Engineering, 27(3). 79-91. Retrieved from http://web.a.ebscohost.com/ehost/pdfviewer /pdfviewer?vid=18&sid=49734b47- 7008-4ed3-b18c-2e24b0e5b6dc%40sessionmgr4008 Venables, M. (2006). Lean fighting machine [helicopter lean manufacturing]. Manufacturing Engineer, 85(3). 12-
12. 17. https://doi.org/10.1049/me:20060302 Venables, M. (2005). Boeing: going for lean [lean manufacturing]. Manufacturing Engineer, 84(4), 26-31. Venkatesh, J. (2007). An introduction to total productive maintenance (TPM). The plant maintenance resource center, 3-20. Willmott, P. (1994), “Total quality with teeth”, The TQM Magazine, Vol. 6 No. 4, pp. 48-50. Wolniak, R., & Skotnicka-Zasadzien, B. (2014). The use of value stream mapping to introduction of organizational innovation in industry. Metalurgija,
13. 53(4). 709-712. Retrieved from http://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=0&sid=ad0 0a744-ebcb- 4a9e-a997-1d7e6a17b54a%40sdc-v-sessmgr06 Womack JP., (2004). A Mentalidade enxuta nas empresas. Editora Campus Rio de Janeiro