

Application of Lean Manufacturing for Green Production Textile Manufacturing: synthesis of literatures

Fabrice Rakotoniaina¹, François Ravalison²

- 1- PhDstudent, Ecole Doctorale en Ingénierie et Géoscience, 101 Antananarivo, Madagascar
- 2- Professor, Centre National de Recherches Industrielle et Technologique, 101 Antananarivo, Madagascar

Corresponding author : Fabrice Rakotoniaina

Adress: Ecole Doctorale en Ingénierie et Géoscience, 101 Antananarivo, Madagascar,

e-mail : fabrice.rakotoniaina@univ-antananarivo.mg

Phone number : ++261 34 22 759 85

Abstract (< or = 250 words)

The climate change agenda wants stakeholders to participate in systemic transformation. Companies need to make products that don't harm the environment and to contribute employee's wellbeing. The process and waste management are considered to manage the manufacturing performance. This research is to make textile manufacturing better for the environment.

As the first step, the Five Whys are used to figure out what the problems are. Then, we use Function Analysis Technical System method to understand how different functions are connected. After that, we use mathematic tools and the Five S to study the results. Finally, we pick research paper from 2002 to 2022 to learn more about the topic.

Lean manufacturing in textile is a way of making products more efficiently and reducing waste. It can help businesses improve operational performance as delivery and quality. Competitiveness is the main results. In roughly year, the on-time delivery rate increased from 10% to 65%. In addition, research on the effects and impacts of Lean manufacturing reveals that it enhances functional execution. Environmental performance increases with Lean tools for green production. The work environment will increase from 40% to 80%. In Asia, these methods are used a lot in the textile industry.

The textile manufacturing unit generates two types of industrial waste: unusable waste and recoverable waste. Faced the challenges of climate change, the first strategy aims to adapt or adjust production processes to boost competitiveness. The second strategy aims at mitigation through sustainable waste management.

Keywords : climate change, competitiveness, sustainable performance, waste

1- Introduction

Scientists are studying ways to make products better for the environment, like buildings and technology. Engineering seeks to advance knowledge, conducts research to support action and develops more effective responses to the challenge posed by climate change. Due to the fact that they account for around 3% of the world's greenhouse gas emissions, textiles have a substantial impact on the climate [1].

The textile industry has three big problems: getting things to customers on time, making sure the clothes are good quality, and dealing with climate change. When clothes are delivered, they create waste and pollution. Product safety and durability are guaranteed through quality control. Climate change is affecting the conditions under which textiles are produced and consumed.

The problem with the search is that it takes a long time for product to be delivered. One reason for this delay is a lack of quality compliance. Textile quality control reduces the possibility of errors, refunds, and complaints by making sure that finished goods meet client requirements and standards. What role does quality have in the delivery for green textiles produced?

This article's goal is to enhance sustainable performance for textile industry through the application of lean manufacturing. A thematic investigation was done. The strategy created aims to educate scholars about networking websites..

2- Methods

Tools required for the synthesis process are included in the methodology. The FAST method helps to understand and respond what companies need. The materials and methods used are shown in Figure 1.

Three functions must be taken into account for knowledge synthesis. The initial job is to specify the research area. The problem was discovered with the Five Whys tool. The reference tools included the various reports and value stream mapping.

The second task is to compile facts and information from the literature and the third is to assess the current circumstance. These two primary functions have been modified using the Five S method. Five concepts and steps seek to improve working conditions and product quality.

To make the surroundings lighter, the first step is to "Seiri" or sort out what is unneeded. The articles have been categorized by common issues and their causes. The second phase, "Seiton," or store, tries to group objects, tools, or documents so that they can be quickly located and prevent needless travel. Zotero was chosen as the digital library to house the chosen materials. In the third phase, "Seiso," or shine the workspace is polished, dusted, or otherwise cleaned. Zotero makes it possible to group related items into collections. The standardization of storage procedures is referred to as "Seiketsu" in the fourth step, which ensures the cleanliness and effectiveness of the work. The final step, "Shitsuke," or sustain refers to continuing to advance in order to advance knowledge and constant improvement. The synthesis itself is done at this stage. Descriptive statistics were produced using mathematical methods.

3- Results

Lean tools are covered in the majority of selected articles and come from Asia, especially Pakistan and India. They improve green productivity through waste reduction. The adoption of lean manufacturing leads to an organization with shorter lead times, improved quality, and reduced costs [2]. Operational performance and environment performance are indicator.

The five Ss, just-in-time (JIT) and quality management (QM) have a significant and positive impact on the operational efficiency of an apparel unit. This performance is measured by the manufacturing plant's ability to produce and deliver products to customers more efficiently [3]. There is a correlation between Lean QM and JIT tools that can translate delivery behavior versus quality. Excellent garment factories have a higher level of QM and JIT implementation than the rest [4]. The researchers noted high and significant correlation values between price, delivery, product flexibility and product quality [5].

There is a positive correlation between JIT tools and 5S [2]. The absence of a Lean strategy can lead to huge waste being created [3]. Faced with climate challenges, waste minimization has a positive impact and impact on functioning. Environmental performance can be measured by a manufacturing plant's ability to reduce waste more efficiently. Five S is a waste reduction tool [5].

4- Discussion

Delivery may affect the quality of textiles depending on the shipping method, transit time, weather conditions and packaging. Therefore, it is necessary to choose a supplier that guarantees fast, safe and environmentally friendly delivery. Textile quality also depends on raw material selection, production techniques and quality control. Delivery times are not affected by the implementation of controls and lean practices [6].

Processes and equipment, product design, supplier and customer relationships significantly influence sustained performance. The ability to observe or track can improve production and delivery [7].

5- Conclusion

The implementation of Lean tools in an industrial production unit brings about a change in the behavior of the actors involved in the system. Therefore, Lean spirit and Lean culture are promoted throughout the production process. To reduce our environmental impact, we must promote ecological textiles, recycle used clothing and limit overconsumption.

Planning and control practices have no significant effect on sustained performance. Environmental objectives can be enhanced by implementing best practices through operational excellence. There are sustainable strategies to reduce the ecological impact of textiles, such as recycling, certification, eco-design or responsible consumption.

6- References

- [1] W. Leal Filho, P. Perry, H. Heim, M.A.P. Dinis, H. Moda, E. Ebhuoma, and A. Paço, “An overview of the contribution of the textiles sector to climate change,” *Frontiers in Environmental Science* **10**, 01-05(2022).
- [2] A. Yame, and D. Al-Werfalli, “Applications of Lean Methodologies and Quality Improvement in Textile Industry,” in *ResearchGate*, 624-631 (2019).
- [3] M. Naeem, N. Ahmad, S. Hussain, B. Nafees, and A. Hamid, “Impact of Lean Manufacturing on the Operational Performance: Evidence from Textile Industry,” *HSSR* **9**(3), 951–961 (2021).
- [4] C.A. Phan, and Y. Matsui, “Contribution of quality management and just-in-time production practices to manufacturing performance,” *International Journal of Productivity and Quality Management* **6**(1), 23–47 (2010).
- [5] M.F. Rasheed, N. Zaheer, W. Hassan, M. Junaid, and A. Majeed, “Role of sustainable supply chain management practices in boosting environmental performance: Empirical evidence from the textile sector of developing economies,” *Geological Journal* , 1-17 (2023).
- [6] F.H. Awan, L. Dunnan, K. Jamil, S. Mustafa, M. Atif, R.F. Gul, and Q. Guangyu, “Mediating Role of Green Supply Chain Management Between Lean Manufacturing Practices and Sustainable Performance,” *Front Psychol* **12**, 1-11 (2021).
- [7] Leandro L. Lorente Leyva, Edwin P. Curillo Perugachi, Ramiro V. Saraguro Piarpuezan, and Carlos A. Machado Orges and Edwin P. Ortega Montenegro, “Lean Manufacturing Application in Textile Industry,” 808-820 (2018).
- [8] T. Mohamed, “Quality Improvement in a Textile Manufacturing Plant Using a Database Management Traceability System,” 99-112 (2018).
- [9] M. Hassainate, and S. Maghraoui, “Triptyque « Cout – Delai – Qualite » : Cas de l’industrie marocaine du textile et de l’habillement,” *La Revue Marocaine de Contrôle de Gestion* (8), (2019).
- [10] H. Ober, S.I. Simon, and D. Elson, “Five Simple Rules to Avoid Plagiarism,” *Ann Biomed Eng* **41**(1), 1–2 (2013).
- [11] B. Schirmer, “Framework for Conducting and Writing a Synthetic Literature Review,” *Walden Faculty and Staff Publications* **19**(1), 94-105 (2018).
- [12] H. Dumez, “Faire une revue de littérature : pourquoi et comment ?,” *Hyper Article en Ligne - Sciences de l’Homme et de la Société*, (2011).
- [13] *Advances in Environmental Research. Volume 97 – Nova Science Publishers.* (s. d.). Consulté 13 octobre 2023, à l’adresse <https://novapublishers.com/shop/advances-in-environmental-research-volume-97/>
- [14] *Environmental and Agricultural Research Summaries (with Biographical Sketches). Volume 10 – Nova Science Publishers.* (s. d.). Consulté 20 octobre 2023, à l’adresse <https://novapublishers.com/shop/environmental-and-agricultural-research-summaries-with-biographical-sketches-volume-10/>
- [15] *Lean Manufacturing : Implementation, Opportunities and Challenges – Nova Science Publishers.* (s. d.). Consulté 26 octobre 2023, à l’adresse <https://novapublishers.com/shop/lean-manufacturing-implementation-opportunities-and-challenges/>
- [16] *Textiles : Advances in Research and Applications – Nova Science Publishers.* (s. d.). Consulté 31 octobre 2023, à l’adresse <https://novapublishers.com/shop/textiles-advances-in-research-and-applications>

7- Tables

8- Figures

Figure 1. FAST Diagram

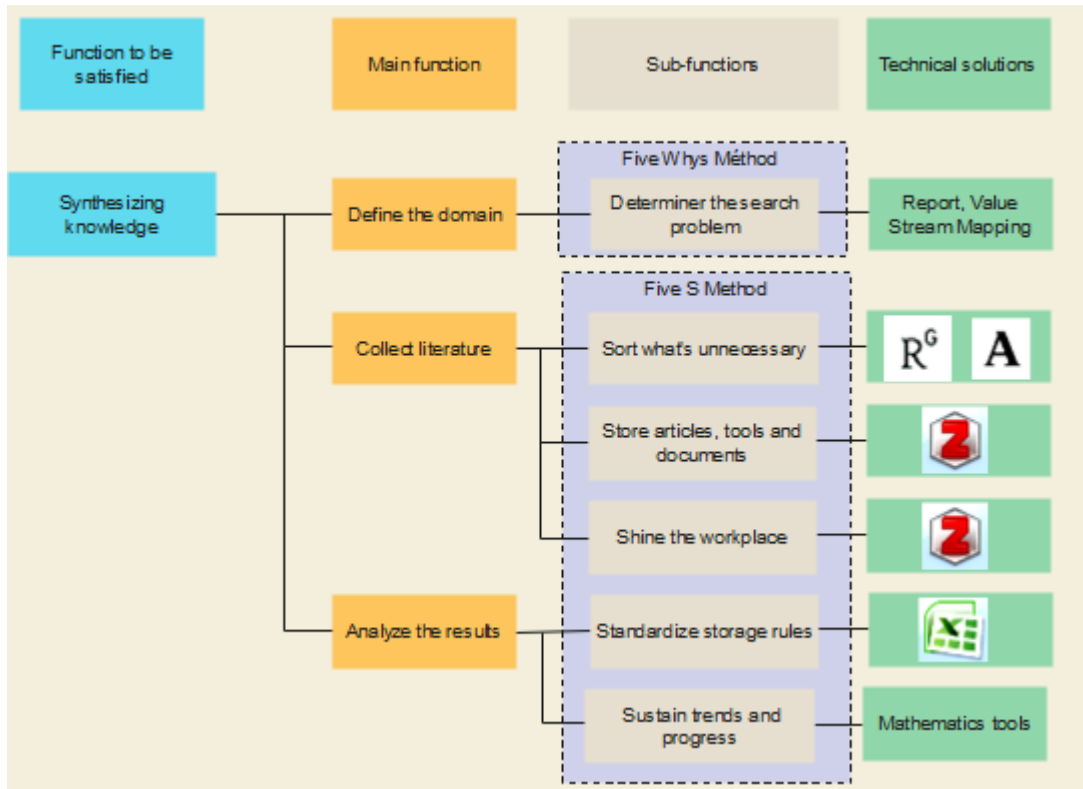


Figure 2. Year of publication

