



Deployment of Lean Six Sigma in Transportation Sector

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ABSTRACT

Lean Six Sigma has been used successfully in industry, healthcare, and banking, among other fields, to deal with these problems. By using Lean Six Sigma, costs have been cut by a lot, quality has improved, and effectiveness has gone up. But there isn't much study on how Lean Six Sigma could be used in the transportation industry. Because the transportation industry is so intricate and ever-changing, it must have procedures that are both efficient and effective in order to guarantee that both people and goods will be transported in a secure manner and on time. Over the past few years, companies in the transportation industry have been looking for ways to improve the quality and efficiency of their processes, which has led to an uptick in interest in the application of Lean Six Sigma.

Keywords: Lean Six Sigma, Transportation sector etc, Healthcare, Transportation industry, Companies.

1. Introduction

The transportation industry is an important part of the global economy because it connects people and companies all over the world (Dahmash and Dahmash, 2017). This area includes air, sea, and land travel (Elbeltagi, 2018). Each of these types of travel has its own set of problems and complexities. But even though the transportation sector is important, it faces many problems, such as safety issues, following rules, dealing with uncertain weather, and unplanned events that could mess up the supply chain (Elbeltagi, 2018). Also, there is always pressure on the shipping industry to cut costs, improve service quality, and work more efficiently (Albliwi, Antony, and Lim, 2016).

Lean Six Sigma has been used successfully in industry, healthcare, and banking, among other fields, to deal with these problems (Dahmash and Dahmash, 2017). Albliwi et al. (2016) conducted a systematic literature review on the application of Six Sigma in the aviation industry, by using Lean Six Sigma, costs have been cut by a lot, quality has improved, and effectiveness has gone up. But

there isn't much study on how Lean Six Sigma could be used in the transportation industry. The goal of this study is to look at how Lean Six Sigma can be used in the transportation industry, including its benefits, problems, and possible solutions.

Background

Lean Six Sigma is a method that blends Lean and Six Sigma to improve the quality and speed of a process. Lean tries to cut down on waste, while Six Sigma tries to cut down on mistakes and improve quality (Elbeltagi, 2018). When these two methods are used together, they make a powerful tool for process growth. Lean Six Sigma has been used successfully in many fields to solve complicated and changing problems.

The transportation business is complicated and always changing. Lean Six Sigma could help a lot in this field. If Lean Six Sigma was used in the shipping industry, it could lead to big cost savings, better quality, and more efficient work. But there are some problems with putting Lean Six Sigma to use in the shipping industry (Elbeltagi, 2018).

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Research Objective

Research objectives are presented below:

- To look into how Lean Six Sigma could be used in the shipping industry.
- To figure out what the pros and cons of Lean Six Sigma are in the shipping industry.
- To figure out how Lean Six Sigma could be made to work better in the transportation industry.
- To make suggestions for how Lean Six Sigma can be used successfully in the transportation industry.

Research Scope

This study work is about how Lean Six Sigma is used in the transportation industry. The paper will talk about the pros and cons of using Lean Six Sigma in different kinds of transportation, such as by air, sea, and land. The talk will also suggest ways that Lean Six Sigma can be used successfully in the transportation industry.

Research question

- How is Lean Six Sigma being used in the shipping industry?
- What are the pros and cons of Lean Six Sigma in the shipping industry?
- How can the difficulties of Lean Six Sigma in the shipping industry be solved?
- What suggestions do you have for getting Lean Six Sigma to work well in the shipping sector?

2. Literature Review

The term "Lean Six Sigma" refers to a technique that brings together the ideas of "Lean manufacturing" and "Six Sigma," respectively (Elbeltagi, 2018). The goal of Lean Six Sigma is to enhance the quality and efficiency of a process by cutting down on the amount of waste, faults, and unpredictability in the process (Elbeltagi, 2018). It is a methodical approach that includes tactics for improving processes, as well as approaches for addressing problems and analysing data. Because it is capable of achieving significant process improvements and cost savings, Lean Six Sigma has become increasingly popular in a variety of industries, including manufacturing, healthcare, and service sectors. This popularity can be attributed to the

fact that Lean Six Sigma has become increasingly popular (Dahmash and Dahmash, 2017).

Lean Six Sigma Methodology

The DMAIC acronym stands for "Define, Measure, Analyse, Improve, and Control (Dahmash and Dahmash, 2017)." This acronym refers to the five stages that are included in the Lean Six Sigma approach. The following are the stages that are included in the DMAIC process, which is a methodical approach to improving processes and finding solutions to problems (Dahmash and Dahmash, 2017).

The first stage, which is also the name of this phase, is to define the problem and the scope of the project. This involves determining the goals of the project, the process that needs to be improved, and the problem that needs to be solved.

The second phase is gathering information about the performance of the process at the present time. This involves determining which factors are most important to the process, gathering data on how well the process is working, and defining a benchmark for further advancement (Elbeltagi, 2018).

The third phase in the process is to analyse the data in order to determine the underlying reason (or causes) of the issue. This comprises the utilization of statistical tools and techniques in order to identify the sources of process variation and assess the influence of the variables on the performance of the process.

The implementation of remedies to address the underlying cause or causes of the problem is the focus of the fourth phase. This includes coming up with a strategy for the improvement of the process, putting that plan into action, determining how successful the solutions are, and finding ways to improve the performance of the process.

The monitoring of the process is the fifth and last phase, and its purpose is to guarantee that the improvements will be maintained throughout time. This comprises designing a control strategy to guarantee that the process stays under control and implementing a continuous improvement process to drive additional improvements. Both of these steps are necessary to ensure that the process remains under control.

Lean Six Sigma Approach in the Transporta-

tion Industry

Because the transportation industry is so intricate and ever-changing, it must have procedures that are both efficient and effective in order to guarantee that both people and goods will be transported in a secure manner and on time. Over the past few years, companies in the transportation industry have been looking for ways to improve the quality and efficiency of their processes, which has led to an uptick in interest in the application of Lean Six Sigma. It has been demonstrated that Lean Six Sigma can be effectively implemented in a variety of transportation settings, including the air, the sea, and the land. Lean Six Sigma has been used in the aviation sector with the goals of enhancing safety, decreasing the number of delays, and improving on-time performance. Lean Six Sigma has been used in the marine industry with the goals of maximizing vessel performance, decreasing fuel consumption, and enhancing overall safety. The supply chain operations involved in the transportation of products have benefited from the use of Lean Six Sigma, which has been utilized to optimize these processes, reduce inventory levels, and increase delivery performance.

Benefits and Challenges of Lean Six Sigma in Transportation

The implementation of Lean Six Sigma in the transportation industry carries with it a number of advantages, including the following, in addition to the inherent difficulties that come along with it:

- Increased productivity and quality of the processes involved Lean Six Sigma assists in the removal of waste, the reduction of defects, and the optimization of processes, all of which lead to an increase in productivity and quality.
- Enhanced levels of customer satisfaction As a consequence of improved delivery times, decreased rates of error, and enhanced levels of service quality, Lean Six Sigma contributes to enhanced levels of customer happiness.
- Decreased expenses Lean Six Sigma assists in the removal of waste and the optimization of processes, both of which lead to a decrease in costs and a rise in profitability.
- Lean Six Sigma contributes to the identification and removal of potential safety threats, which ultimately results in an improvement in

both safety and security.

- Higher employee engagement and empowerment Lean Six Sigma helps to empower individuals to identify and address problems, which ultimately results in higher employee engagement and increased job satisfaction.

In spite of this, implementing Lean Six Sigma in the transportation industry is not without its share of obstacles. One of the difficulties is dealing with those who are resistant to change.

- The inaccessibility of some data.
- Processes that are both complex and fluid.
- Regulatory compliance.
- The inability to accurately anticipate the weather.

Previous Research Concerning the Application of Lean Six Sigma in the Transportation industry

A number of studies have been carried out on the implementation of Lean Six Sigma in the transportation industry. According to the findings of these research, Lean Six Sigma is a successful methodology for solving complex and ever-evolving issues in the transportation industry. While some of the studies have concentrated on the application of Lean Six Sigma in particular modes of transportation, others have investigated the application of Lean Six Sigma throughout the entirety of the transportation industry. The studies have offered invaluable insights into the benefits, obstacles, and best practices for the adoption of Lean Six Sigma in the transportation industry (Laudon, Laudon, and Schoderbek, 2016).

One research project that was carried out by Chen et al. (2018) centred on the use of Lean Six Sigma in a maritime transportation firm in Taiwan. According to the findings of the study, implementing Lean Six Sigma led to considerable increases in the quality of products produced as well as the level of happiness felt by consumers. In a separate piece of research that they carried out in 2016, Akinci and Vatansever investigated the potential applications of Lean Six Sigma in the aviation industry. According to the findings of the study, putting Lean Six Sigma into practice led to a decrease in the number of flight delays, an improvement in on-time performance, and an increase in customer satisfaction.

In Saudi Arabia, a public transportation

agency was the focus of an investigation on the use of Lean Six Sigma that was carried out by Al-Najjar and colleagues (2021). According to the findings of the study, implementing Lean Six Sigma led to substantial gains in service quality, as well as a reduction in expenses and an increase in staff engagement. Another research that was carried out by Hossain and colleagues (2019) centred on the use of Lean Six Sigma in the transportation sector of Bangladesh's road network. According to the findings of the study, implementing Lean Six Sigma led to a reduction in the amount of time needed for transportation, improvements in both safety and security, and an increase in customer satisfaction.

Theoretical framework

The Lean Six Sigma framework and the transportation process framework make up the two primary components of the conceptual framework for the implementation of Lean Six Sigma in the transportation industry (Laudon, Laudon, and Schoderbek, 2016). The Lean Six Sigma framework is a systematic approach to problem-solving and process improvement that combines the ideas of lean manufacturing and Six Sigma. Its name comes from the combination of these two methodologies (Laudon, Laudon, and Schoderbek, 2016). The DMAIC acronym stands for Define, Measure, Analyse, Improve, and Control, and it describes each of the five stages that are included in the Lean Six Sigma framework. The DMAIC method is utilized to determine and treat the underlying cause of an issue, as well as to apply remedies that enhance the effectiveness and calibre of a process. The framework of Lean Six Sigma has been effectively utilized in a variety of industries, including the healthcare industry, the manufacturing industry, and the service industry.

The movement Process Framework is a framework that covers the primary processes that are involved in the movement of both people and products (Laudon, Laudon, and Schoderbek, 2016). The framework for the transportation process covers a variety of procedures, including planning, scheduling, dispatching, loading, unloading, and delivery (Yang and Yang, 2017). The foundation for the transportation process also incorporates the many different modes of transportation, such as land, sea, and air travel. Under-

standing the intricate and ever-changing nature of the transportation industry is impossible without a solid conceptual grounding in the transportation process framework (Yang and Yang, 2017).

The integration of the Lean Six Sigma framework with the transportation process framework entails applying the concepts of Lean Six Sigma to the procedures that are involved in the transportation processes (Yang and Yang, 2017). The integration of the frameworks requires determining and resolving the underlying reason or causes of the transportation issues, as well as putting into action solutions that will improve the effectiveness and quality of the process (Yang and Yang, 2017). The integration of the frameworks may lead to major improvements in transportation operations, such as enhanced on-time performance, decreased transportation time, and greater customer satisfaction. These changes can be brought about through the integration of the frameworks (Laudon, Laudon, and Schoderbek, 2016).

3. Research Methodology

Research design

This study used a research design known as secondary research, which entails gathering and evaluating data from pre-existing sources such as scholarly journals, books, and internet databases. The use of Lean Six Sigma in the transportation industry may be better understood with the help of existing information uncovered through secondary research, which is valuable in this endeavour.

Data Collection

In order to acquire the necessary information for this study, the researchers conducted a search for pertinent scholarly publications, books, and online databases that were all in some way connected to the implementation of Lean Six Sigma in the transportation industry. During the course of the search, we utilized a number of different keywords, including "Lean Six Sigma," "transportation," "logistics," and "process improvement." The majority of the information gathered was qualitative in character, and it took the form of literature reviews and case studies that were connected to the implementation of Lean Six Sigma in the transportation industry.

Data analysis

A method known as thematic analysis was used to examine all of the data that was gathered. Finding recurring themes or patterns in the data and classifying them according to their significance are both part of the process of thematic analysis. The method of analysis consisted of examining the obtained material many times, determining the most important concepts, and organizing those concepts into themes. Following this, the themes were analysed and interpreted so that we could gain some understanding of how Lean Six Sigma could be applied in the transportation industry.

Limitation

There is a possibility of bias in the selection of sources, which is one of the constraints of this study, along with the restricted scope of the investigation, which is another restriction. The examination of secondary data is the primary emphasis of this study; nevertheless, it is possible that this will not offer a thorough knowledge of how Lean Six Sigma may be used in the transportation industry. In addition, the research can have certain restrictions due to the accessibility and reliability of the data sources.

4. Finding and Results

Advantages of Implementing Lean Six Sigma in the Transportation Industry

There are a number of advantages to implementing Lean Six Sigma in the transportation industry, including the following:

- Improved process efficiency and quality
- Increased customer satisfaction
- Reduced costs
- Improved safety and security
- Increased employee engagement and empowerment (Yang and Yang, 2017).

Lean Six Sigma in Transportation

Challenges

Lean Six Sigma in the transportation industry is not without its share of obstacles. The following are examples of some of the challenges:

- A resistance to change
- The lack of data availability
- Complex and dynamic procedures
- Regulatory compliance
- Unpredictable weather conditions (Yang

and Yang, 2017).

Implementation Success Factors

Cheng and Podolsky (2016) used Lean Six Sigma to improve container shipping in the liner industry the successful implementation of Lean Six Sigma in the transportation industry requires the consideration of a number of factors, including:

Benefit

The application of Lean Six Sigma in the transportation sector can result in a number of benefits, including the following:

- Improved process efficiency and quality
- Increased customer satisfaction
- Reduced costs
- Improved safety and security
- Increased employee engagement and empowerment (Singh and Singh, 2015).

Ways to Overcome Challenges

The adoption of Lean Six Sigma in the transportation industry presents a number of obstacles, which can be circumvented using a variety of methods, including the following:

- Communication and education
- Participation from stakeholders and empowerment of those stakeholders
- Process simplicity and standardization
- Ongoing quality improvement
- The gathering and examination of data (Shafiq and Ali, 2017).

Strategies for Implementation

The transportation industry must take into consideration a number of different strategies in order to successfully implement Lean Six Sigma (Kim, Jeong, and Kwon, 2015). These strategies include: leadership support; employee engagement and empowerment; clear definition of problem statement and scope; proper training and education; continuous improvement (Shafiq and Ali, 2017). During the process of implementing Lean Six Sigma in the transportation industry, there are a number of best practices that can be followed, including the following:

- Establishing a culture of constant improvement
- Defining and monitoring important indicators

- Involving stakeholders at every stage of the process;
- Employing a methodical approach to problem-solving
- Leveraging data to guide decision-making.

Tools and Methods for the Actualization of an Idea

During the process of implementing Lean Six Sigma in the transportation industry, several tools and methods may be utilize such process mapping root cause analysis statistical process control design of experiments failure mode and effects analysis design of experiments process mapping (Shafiq and Ali, 2017).

5. Conclusion

Lean Six Sigma has been used successfully in industry, healthcare, and banking, among other fields, to deal with these problems. By using Lean Six Sigma, costs have been cut by a lot, quality has improved, and effectiveness has gone up. But there isn't much study on how Lean Six Sigma could be used in the transportation industry. Because the transportation industry is so intricate and ever-changing, it must have procedures that are both efficient and effective in order to guarantee that both people and goods will be transported in a secure manner and on time. Over the past few years, companies in the transportation industry have been looking for ways to improve the quality and efficiency of their processes, which has led to an uptick in interest in the application of Lean Six Sigma.

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In short, using Lean Six Sigma in the transportation industry could make processes more efficient, improve quality, make them safer, and make customers happier. Even though there are problems, studies have shown that Lean Six Sigma can be used successfully in different types of transportation, such as air, sea, and land. Studies have also shown how important it is to have good project management, involve stakeholders, analyse data, have leadership support, and keep improving for Lean Six Sigma to work well.

Recommendations for Future Implementation:

Based on the review of the literature and the results of earlier studies, we can make the following suggestions for the successful application of Lean Six Sigma in the transportation sector:

- Learn as much as you can about how transportation works and what the customer needs.
- Engage workers at all levels and give them the tools they need to find and solve problems.
- Collect and look at facts to find the problem's root cause
- Find and use methods that deal with the problem's root cause
- Keep an eye on and control the process to make sure the changes last.
- Encourage a mindset of learning and improving all the time.

This paper adds to what has already been written by giving an outline of how Lean Six Sigma can be used in the transportation sector. The paper talks about the rewards, difficulties, and best ways to use Lean Six Sigma in the shipping industry. Researchers and practitioners who want to know how to use Lean Six Sigma in the transportation sector successfully can learn a lot from the results of past studies.

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