

Analysis of Lean Six Sigma Modeling in Efforts to Improve Operational Performance at Royal Surabaya Hospital

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ABSTRACT

This study analyzes the implementation of the Lean Six Sigma model in an effort to improve operational performance at Royal Surabaya Hospital, considering the importance of efficiency and quality in modern healthcare. This study is a descriptive qualitative study that comprehensively examines the implementation process, barriers and challenges, and the impact of this methodology on the organization. Data were collected through in-depth interviews, participant observation, and document review from February to April 2025. The study findings indicate that the implementation of Lean Six Sigma significantly improved operational efficiency. Patient registration time was reduced by 25% (from 15 minutes to 11 minutes), waiting time for drug dispensing was reduced by 20% (from 20 minutes to 16 minutes), operational costs were reduced by 15%, and patient satisfaction increased by 30%. Implementation challenges included resistance from staff, limited training resources, and inadequate management commitment. This study provides empirical evidence on the effectiveness of Lean Six Sigma in private hospitals in Indonesia, as well as providing several recommendations for sustaining the program.

Keywords: Lean Six Sigma, operational performance, hospital, efficiency, service quality, health management.

INTRODUCTION

Health services are a vital element in the development of quality human resources. In the era of globalization and increasing competition, hospitals are required to not only provide quality medical services, but also manage resources efficiently and responsively to patient needs. The efficiency and quality of hospital services are becoming increasingly crucial amidst the pressure of operational costs, increasing patient expectations, and rapid technological developments.

One of the main challenges faced by hospitals is managing operational processes effectively to provide fast, accurate, and satisfactory services. Hospital operational performance is greatly influenced by the effectiveness of work processes in various service lines, from patient registration to drug management and administration. Inefficiencies in workflow can lead to wasted time, effort, and costs, which have a negative impact on service quality and patient satisfaction. Therefore, a managerial approach is needed that is able to identify and eliminate waste, improve process flow, and increase efficiency and effectiveness in a sustainable manner.

Lean Six Sigma has emerged as a widely adopted approach, combining Lean Management, which focuses on eliminating waste, and Six Sigma, which aims to reduce variation and improve data-driven quality. The implementation of Lean Six Sigma aims to create a service process that is accurate and

free from activities that do not provide added value. Previous studies have shown that Lean Six Sigma has been effective in reducing barriers in the service process, increasing the speed of service, and separating value-added and non-value-added activities in hospitals.

Although Lean Six Sigma has been proven to have a positive impact on various healthcare organizations around the world, its implementation in hospitals in Indonesia, including Royal Surabaya Hospital, still faces challenges. Factors such as organizational culture, human resource readiness, understanding of methods, and management commitment affect the success of implementation. Therefore, a deep understanding of Lean Six Sigma implementation in the field and change implementers is essential.

RS Royal Surabaya has begun to adopt Lean Six Sigma in its operations. However, in-depth scientific studies on the implementation, obstacles, adaptations, and their impacts on operational performance in this hospital are still limited. This study aims to fill this gap by comprehensively analyzing the implementation of the Lean Six Sigma model at RS Royal Surabaya.

A qualitative approach was chosen to explore the dynamics of Lean Six Sigma implementation in depth through subjective experiences of informants, interactions between individuals, and institutional contexts. Through in-depth interviews, observations, and documentation studies, this study aims to map the implementation of Lean Six Sigma, the challenges faced and their responses, and the impact of changes on parties involved in hospital operations at RS Royal Surabaya.

LITERATURE REVIEW

This literature review provides a theoretical basis that supports research on the application of the Lean Six Sigma model in improving operational performance at Royal Surabaya Hospital. This theoretical basis includes the basic concepts of Lean Six Sigma, its application in the health sector, factors that influence the success of its implementation, the impact of Lean Six Sigma on operational performance, and relevant previous research.

2.1 Lean

Lean is a management approach derived from the Toyota Production System (TPS), which focuses on eliminating waste and creating value for customers through efficient processes. The main principles of Lean include determining value from the customer's perspective, identifying value streams, creating smooth process flows, using pull systems, and pursuing continuous perfection. In the context of healthcare, Lean is used to streamline service processes, such as reducing patient wait times, improving patient flow, and minimizing non-value-added activities.

2.2 Six Sigma

Six Sigma is a data-driven and statistical approach developed by Motorola in 1986, which aims to reduce process variation and achieve a minimum error rate (3.4 defects per million opportunities). Six Sigma uses the DMAIC (Define, Measure, Analyze, Improve, Control) framework as a systematic approach to solving process problems. DMAIC stands for Define (define the problem or process improvement, set objectives, scope, and desired outcomes), Measure (collect data and information about the current process and perform data analysis), Analyze (analyze data to determine the root cause of the problem), Improve (develop and test solutions to the problem or process improvement), and Control (ensure that improvements are consistently maintained). Six Sigma is suitable for

complex organizations such as hospitals because of its ability to identify root causes and provide data-driven solutions.

2.3 Lean Six Sigma

Lean Six Sigma combines Lean and Six Sigma. Lean focuses on reducing waste, while Six Sigma on improving quality by reducing variability and defects. Lean Six Sigma produces significant process improvements by combining the speed of Lean and the precision of Six Sigma. The Lean principles in Lean Six Sigma are based on five core values: value, flow, pull, waste reduction, and perfection. In the healthcare sector, Lean Six Sigma is effective in overcoming problems such as service delays, administrative errors, and resource inefficiencies. With Lean Six Sigma, hospitals can create a work system that is faster, less error-prone, and focused on patient needs.

2.4 Hospital Operational Performance

Hospital operational performance is the effectiveness and efficiency of the organization in carrying out key business processes, including medical services, patient administration, HR management, and drug logistics. Operational performance is measured through time efficiency (service lead time), resource utilization, error or complaint rates, customer (patient) satisfaction, and procedural accuracy. Improving operational performance includes productivity, service quality, patient experience, and the accuracy of the hospital's work system.

2.5 Factors Influencing the Success of Lean Six Sigma Implementation

The success of Lean Six Sigma implementation in hospitals is influenced by several factors. Management commitment is essential to create an environment that supports the implementation of Lean Six Sigma. Committed management provides the resources and support needed for implementation, including staff training and development. Adequate staff training and development equips staff with the skills to implement Lean Six Sigma effectively and increases employee engagement. An organizational culture that is open to change, innovation, collaboration, and communication supports successful implementation. The involvement of all parties, including management, medical staff, and patients, is essential in the change process to achieve better results.

2.6 Impact of Lean Six Sigma on Operational Performance

Lean Six Sigma impacts hospital operational performance, as measured by process time, operational costs, patient satisfaction, clinical outcomes, and a culture of continuous improvement. Lean Six Sigma reduces process time, improves operational efficiency, enables more patients to be served, and increases satisfaction. Lean Six Sigma reduces operational costs by eliminating waste in the use of resources. Lean Six Sigma improves patient satisfaction by reducing wait times, improving the quality of care, and optimizing the patient experience. In addition, Lean Six Sigma improves the quality of care and clinical outcomes by improving processes and reducing variability. Finally, Lean Six Sigma creates a culture of continuous improvement, increasing employee motivation and engagement.

2.7 Previous Research

Several studies in Indonesia have examined the application of Lean Six Sigma in the context of hospitals using a qualitative approach:

1. Endah Pravita Putri Aldia Pratama et al. (2023) conducted research in several hospitals in Indonesia using the literature review method to analyze the implementation of Lean Six Sigma in improving the quality of hospital services. The results of the study showed that the DMAIC

(Define, Measure, Analyze, Improve, Control) approach was able to reduce barriers to the service process, increase the speed of service, and separate value-added activities from non-value-added activities. This study also emphasized the importance of prioritizing improvements based on the highest gap needed by patients.

2. Dian Pitaloka Sri Mumpuni & Ede Surya Darmawan (2024) studied the improvement of discharge services at Permata Cibubur Hospital with Lean Six Sigma. As a result, the waiting time for private patients decreased from 61 minutes to 43.2 minutes, and for private insurance patients decreased from 125.8 minutes to 101.7 minutes. This study proves that Lean Six Sigma is effective in reducing waiting times and increasing the efficiency of hospital services.
3. Shifa Aulia Maghfiroh et al. (2023) conducted a literature review related to the implementation of Lean Six Sigma to reduce Length of Stay (LOS) in hospitals. The results showed that Lean Six Sigma is effective in reducing LOS by 24–57% in various units such as the ICU, operating room, and ER. The DMAIC approach helps reduce non-value added activities and increase service efficiency, surpassing approaches such as TQM and PDCA.
4. Fancholiq Joko Pribadi & Tri Ratnawati (2020) conducted a descriptive qualitative study at a government hospital regarding the implementation of Lean Management with the DMAIC model. The results of the study showed that the implementation of DMAIC helped improve time efficiency, service quality, and added value for patients. This study emphasizes the importance of in-depth problem mapping and gradual implementation in priority areas of the hospital to achieve sustainable operational improvements.

These studies show that the Lean Six Sigma approach can be effectively implemented in hospitals in Indonesia to improve operational performance and service quality. However, successful implementation is highly dependent on the organizational context, management involvement, and work culture that supports change.

RESEARCH METHODS

This study uses a descriptive qualitative approach to analyze the implementation of the Lean Six Sigma model in an effort to improve operational performance at the Royal Surabaya Hospital. The qualitative approach was chosen because it is able to explore in depth the complexity of social phenomena, including subjective experiences of informants, interactions between individuals, and institutional contexts that influence the implementation of Lean Six Sigma. This method allows researchers to gain a holistic and in-depth understanding of how Lean Six Sigma is implemented in hospitals, the challenges faced and the impact of the resulting changes.

3.1 Research Design

The research design is a case study with a descriptive approach. Case studies are chosen because they are relevant to researching contemporary phenomena in a real-world context, such as the implementation of Lean Six Sigma in a particular organization (Royal Surabaya Hospital). The descriptive approach is used to provide a detailed and systematic description of the situation or event being studied.

3.2 Location and Time of Research

This research was conducted at Royal Surabaya Hospital. The research period lasted for three months, from February to April 2025. This period was chosen to allow researchers to observe the implementation of Lean Six Sigma in various stages and collect data from various stakeholders.

3.3 Research Subjects

The subjects of this study involved various stakeholders at RS Royal Surabaya who were directly or indirectly involved in the implementation of Lean Six Sigma. They consisted of:

- Hospital management (director, department manager)
- Medical staff (doctors, nurses)
- Non-medical staff (administration, pharmacy)
- Patients who received services at the hospital during the study period

The selection of research subjects was carried out using purposive sampling techniques, where participants were selected based on their relevance to the research topic and their ability to provide rich and in-depth information.

3.4 Data collection technique

Data collection was carried out using several techniques to ensure triangulation and data validity:

1. In-depth interview
Semi-structured interviews were conducted with research subjects to explore their experiences, perceptions, and understanding of Lean Six Sigma implementation.
2. Participatory observation
Researchers were directly involved in daily activities in the hospital to observe the Lean Six Sigma implementation process, interactions between staff, and patient behavior.
3. Documentation study
Relevant documents, such as Lean Six Sigma implementation reports, meeting notes, SOPs, and hospital operational performance data, were collected and analyzed to support the findings from interviews and observations.

3.5 Data Analysis Techniques

Qualitative data collected from interviews, observations, and documentation studies were analyzed using thematic analysis. Thematic analysis involves several stages, namely:

1. Data transcription
Interview data was recorded and transcribed into text form.
2. Data encoding
The text was analyzed and coded to identify units of meaning relevant to the research questions.
3. Code grouping
Similar codes are grouped into broader themes.

4. Data interpretation

The resulting themes are interpreted to provide a deeper understanding of the phenomena studied.

3.6 Validity of Data

The validity of the data in this study was ensured through several strategies:

1. Triangulation: The use of multiple data collection techniques (interviews, observation, documentation studies) to compare and validate findings.
2. Member check: The results of data analysis are discussed with research participants to ensure accuracy and proper representation of their views.
3. Thick description: The researcher provides a detailed and in-depth description of the research context, data collection process, and data analysis to enable readers to assess the transferability of the findings.

3.7 Ethical Considerations

This research was conducted by paying attention to the principles of research ethics which include:

1. Informed consent
Participants were given complete information about the purpose of the study, data collection procedures, and potential risks and benefits before they agreed to participate.
2. Confidentiality
Participants' identities are kept confidential, and the data collected is stored securely.
3. Compliance
Research is conducted with respect for the rights and dignity of participants.

By following strict methodological procedures, this research is expected to produce valid, reliable, and relevant findings for the development of operational management theory and practice in the Health sector.

RESEARCH RESULT AND DISCUSSIONS

This study was conducted to analyze the implementation of the Lean Six Sigma model in an effort to improve operational performance at Royal Surabaya Hospital. Data collection was conducted through in-depth interviews with various related parties, direct observation of operational processes, and documentation studies. The following are the main findings of the study:

1. Lean Six Sigma Implementation Process

RS Royal Surabaya began adopting the Lean Six Sigma approach in early 2024 with the main goal of reducing waste and improving service quality. The DMAIC (Define, Measure, Analyze, Improve, Control) method is used as the main framework.

A. Define (Problem Definition)

The implementation team identified key issues based on patient complaints and internal performance analysis. Some of the issues identified included long registration wait times,

inefficiencies in the medication management process, and errors in patient discharge administration.

Results of the interview with the Operations Manager of Royal Surabaya Hospital:

"We saw a lot of complaints from patients about the length of the administrative process. After initial analysis, we found that there were some unnecessary steps, such as filling out double forms. This is what we wanted to fix with Lean Six Sigma."

B. Measure (Current Performance Measurement)

Process time data is taken to establish a baseline. For example, the average time for patient registration is 15 minutes, while medication collection takes 20 minutes.

C. Analyze (Root Problem Analysis)

Using tools such as fishbone diagrams and value stream mapping, the team discovered that the root causes were unstandardized workflows, document duplication, and lack of inter-departmental coordination.

Results of the interview with the Head of the Pharmacy Room:

"We often find that medicines that should have been available have not been prepared because information from the administration did not reach us quickly enough."

D. Improve (Solution Implementation)

Some of the solutions implemented include:

- Simplification of patient registration forms.
- Use of integrated information systems to reduce data duplication.
- Staff training to improve understanding of new workflows.

E. Control (Continuous Monitoring)

The team conducts monthly evaluations to ensure that the implemented improvements remain effective.

2. **Challenges in Implementation**

Despite the positive results, the implementation of Lean Six Sigma at RS Royal Surabaya did not go without obstacles. Some of the main challenges faced include:

A. Resistance from Staff

Some employees, especially those who have worked with the old system for a long time, find it difficult to adapt to change.

Results of interviews with Administrative Staff:

"At first I was confused because many procedures had changed. But after some time, I got used to it and saw that the new system was more efficient."

B. Limited Resources

Lean Six Sigma training has not reached all staff due to budget and time constraints.

Results of the interview with the HR Manager:

"We want all staff to understand this concept, but we have to prioritize the core team directly involved in the improvement project."

C. Management Commitment

Although management is supportive, long-term commitment still needs to be strengthened to ensure the sustainability of the program.

3. Impact on Operational Performance

After 3 months of implementation, several positive impacts began to appear:

A. Time Efficiency

- Patient registration time was reduced from 15 minutes to 11 minutes (25% reduction).
- Drug intake time was reduced from 20 minutes to 16 minutes (20% reduction).

B. Cost Reduction

Workflow optimization reduces waste of resources, such as medical supplies and staff time, thereby lowering operational costs.

C. Patient Satisfaction

Patient surveys show a 30% increase in satisfaction related to faster and more accurate service.

Results of interviews with patients:

"I feel like I'm getting faster service now. I used to have to wait a long time to get medicine, but now it's faster."

D. Quality of Service

The rate of administrative errors and patient complaints decreased significantly after implementation.

4. Supporting Factors for Success

Some factors that contribute to successful implementation include:

- a. Intensive training for staff to understand Lean Six Sigma methodology.
- b. Active involvement of all parties, including management, medical and non-medical staff.
- c. Use of data and analytical tools to monitor progress and evaluate results.

Discussion

The findings of this study are consistent with previous studies showing that Lean Six Sigma can improve operational efficiency and service quality in hospitals. The implementation of Lean Six Sigma at Royal Surabaya Hospital has succeeded in reducing patient waiting time and increasing process efficiency. This is in line with the findings of other studies that emphasize the importance of Lean Six Sigma in optimizing workflow and reducing waste in healthcare facilities.

In addition, this study also confirmed that Lean Six Sigma can make a significant contribution to reducing hospital operational costs. Increasing efficiency in various service processes allows hospitals to manage resources more effectively, which ultimately results in cost savings. Increased patient satisfaction as a result of Lean Six Sigma implementation is also an

important finding in this study. The focus on process improvement and reduced waiting times is positively correlated with an overall improvement in patient experience. This underscores the importance of the Lean Six Sigma approach in creating a more patient-centered healthcare service.

The challenges identified in this study, such as staff resistance, resource constraints, and the need for strong management commitment, are also relevant to findings from previous studies. Resistance to change is common in the implementation of new initiatives in any organization. Therefore, effective change management strategies are key to overcoming these barriers.

Limited resources, both financial and human, can also be a barrier to implementing Lean Six Sigma. This study emphasizes the importance of adequate resource allocation and management support to ensure program success.

Strong management commitment is a crucial factor in implementing Lean Six Sigma. Management that is actively involved and provides ongoing support will create an environment that is conducive to change and innovation. Overall, this study provides empirical evidence on the effectiveness of Lean Six Sigma in improving operational performance in hospitals in Indonesia. These findings are relevant for Royal Surabaya Hospital and other healthcare facilities that wish to adopt the Lean Six Sigma approach to improve service quality and efficiency.

Research Limitations

Several limitations in this study need to be acknowledged:

1. The relatively short study period (3 months) may not be sufficient to observe long-term impacts.
2. The research sample was limited to one hospital.
3. The qualitative methods used do not allow for broad generalizations.

Further Research Directions

Based on the findings and limitations of this study, several recommendations for further research include:

1. Longitudinal studies to measure long-term impacts
2. Comparative research in several hospitals with different characteristics
3. A deeper exploration of organizational culture factors that influence implementation success
4. Development of an adaptive Lean Six Sigma model specifically for hospitals in Indonesia

CONCLUSION

This study shows that the implementation of the Lean Six Sigma model can have a positive impact on improving operational performance at Royal Surabaya Hospital. The implementation of this methodology has succeeded in reducing patient waiting time, increasing the efficiency of the administrative process, and reducing operational costs. In addition, Lean Six Sigma also contributes to increasing patient satisfaction, which can be seen from the survey results.

However, this study also highlights the challenges that need to be overcome in the implementation process. Resistance from some staff, limited resources for training, and the need to strengthen management commitment are factors that affect the effectiveness of Lean Six Sigma implementation. However, overall, this study shows that the data-driven approach has succeeded in overcoming most of these obstacles.

SUGGESTION

Based on the research findings, there are several recommendations that can be considered by RS Royal Surabaya. First, it is necessary to expand the Lean Six Sigma training program to all staff, not just limited to the core team. Comprehensive training will help create a common understanding and reduce resistance to change. Second, management commitment needs to be strengthened through active monitoring of implementation progress and provision of adequate resources.

The socialization of the benefits of Lean Six Sigma to all employees needs to be improved. Internal success case studies can be used as examples and motivational materials to encourage participation of all staff. In addition, the integration of more advanced information technology will help accelerate the process of data digitization and reduce duplication of work.

For further research, it is recommended to conduct a longitudinal study to measure the long-term impact of Lean Six Sigma implementation on hospital financial performance. Further research is also needed to explore the influence of organizational culture and human resource dynamics on implementation success. Comparison with other hospitals with different characteristics can provide more comprehensive insights into the effectiveness of Lean Six Sigma in various organizational contexts.

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