



# Proposed Improvement of the Contract Award Process in Contracting and Procurement using Lean Six Sigma Methodology (A Case Study of an Oil and Gas Company in Indonesia)

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**ABSTRACT:** Oil and gas (O&G) production is crucial for Indonesia's economy, and Company XYZ is actively involved in O&G exploration and production in three operational fields. Effective contracting and procurement procedures are essential for timely access to equipment, services, and materials while minimizing costs, delays, and risks. O&G procurement involves various responsibilities such as procuring drilling rigs, equipment, seismic services, and transportation. Insufficient planning in these processes can lead to project delays, increased expenses, and lower profitability. To address these challenges, the research proposes implementing Lean Six Sigma principles with the DMAIC methodology to improve the contracting and procurement process. In the Define phase, the current state of the contract award process is identified through process mapping. The Measure phase evaluates the internal contract routing approval performances, highlighting variations in completion time for IRS documents. The Analyze phase identifies factors contributing to redundancy, including lack of digitization, absence of a contract control system, time-consuming processes, and a complicated routing process. The Improve phase recommends three solutions: implementing a contract monitoring and control system, streamlining the contract approval routing process, and digitizing the contracting and procurement processes. These solutions aim to improve efficiency, coordination, and decision-making, ultimately enhancing the contract award process, reducing delays, and increasing operational effectiveness and profitability. The Control phase ensures the sustainability of proposed solutions through regular monthly reviews to assess the effectiveness of the control plan and make necessary improvements.

**KEYWORDS:** Contract Award, DMAIC, Lean Six Sigma, Procurement, O&G.

## INTRODUCTION

Indonesia is a significant producer of Oil and Gas (O&G), with the industry playing a vital role in the country's economy. Company XYZ is actively involved in O&G exploration and production in three operating fields in Indonesia, namely Block A, Block T, and Block N. O&G exports contribute over 20% to Indonesia's overall export earnings and support numerous jobs. Company XYZ is committed to ethical and sustainable business practices, supporting local content and promoting social and economic advancement in its operating areas. O&G production involves key activities such as exploration, subsurface analysis, drilling, daily operations, and procurement. Contracting and procurement are crucial for ensuring timely access to equipment, services, and materials, minimizing costs, delays, and risks. Inadequate planning in these processes can result in project delays, increased expenses, and reduced profitability. To achieve operational excellence, the Lean Six Sigma methodology can be used to optimize procurement processes, eliminate waste, optimize data analysis, and enhance overall effectiveness. By improving procurement procedures, organizations can strengthen supplier relationships, better serve customer needs, and generate more value.

## BUSINESS ISSUES

Drilling plays a vital role in the O&G industry as it enables the discovery and extraction of hydrocarbons. It involves creating wellbores to access O&G sources, allowing for the identification of hydrocarbon reservoirs and reducing the risk of drilling dry wells. Drilling campaigns drive technological advancements to improve efficiency and safety, ensuring the well-being of workers and environmental protection. These operations also have a positive economic impact by generating jobs and income in the local community. The contracting and procurement process is essential for supporting a drilling campaign, involving the identification, acquisition, and management of necessary goods and services. This process covers the entire drilling campaign, from initial planning to the final close-out phase. The procurement team plays a vital role in ensuring the efficient and safe execution of the drilling

campaign by managing the supply chain, monitoring deliveries, collaborating with vendors, and resolving any issues or delays that may arise. The team's effectiveness is crucial for completing the project on time and within budget, which is essential for the overall profitability of the business. The company has encountered challenges related to variation and redundancy in the contract approval routing process, resulting in potential time delays. This issue arises from the need to process contracts within a specified timeframe, select qualified vendors, and minimize cost escalation to prevent any negative impacts on the company. Delays in gas production, non-compliance with delivery commitments, and reduced revenue are among the potential losses the company may face. To ensure the smooth progress of drilling projects and align with government commitments, all contracts must be executed according to the agreed schedule. The Procurement & Contracting Management System (PCMS) has identified redundant processes, prompting the adoption of a Lean Six Sigma approach to expedite the process and ensure on-time delivery of drilling project contracts.

### METHODOLOGY

The research framework employed in this study is based on the gap framework. The initial state of the organization at the start of the project is referred to as the current state, while the desired outcome or state resulting from the project-driven change is known as the future state. Projects are crucial for generating business value as they enable organizations to meet stakeholder expectations, achieve strategic goals, improve operational efficiency, and ultimately increase profitability [5]. This study aims to improve the contract award process using the Lean Six Sigma DMAIC framework, a combination of Lean principles with Six Sigma methodology. In the lean management philosophy, creating value for consumers is prioritized while reducing waste. Value, Value Stream, Flow, Pull, and Perfection are the five fundamental principles upon which this philosophy is built. These ideas assist organizations in delivering value and minimizing waste [6]. The Six Sigma methodology is a way of problem-solving that focuses on reducing variability and defects in corporate processes. It adheres to the DMAIC framework, which stands for Define, Measure, Analyze, Improve, and Control. DMAIC offers a structured approach for solving problems related to quality and process improvement. By using this framework, organizations can systematically identify and address issues within their products, processes, or services. The ultimate goal of Six Sigma is to understand and fulfill customer needs, as this is considered essential for achieving profitability [3].

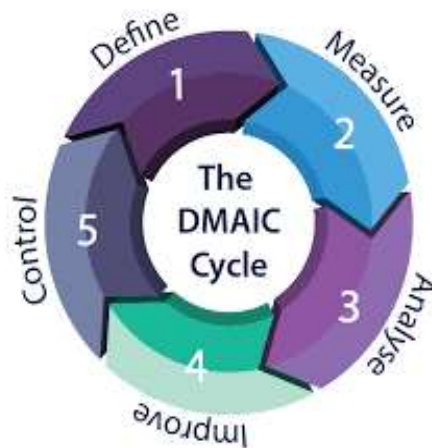


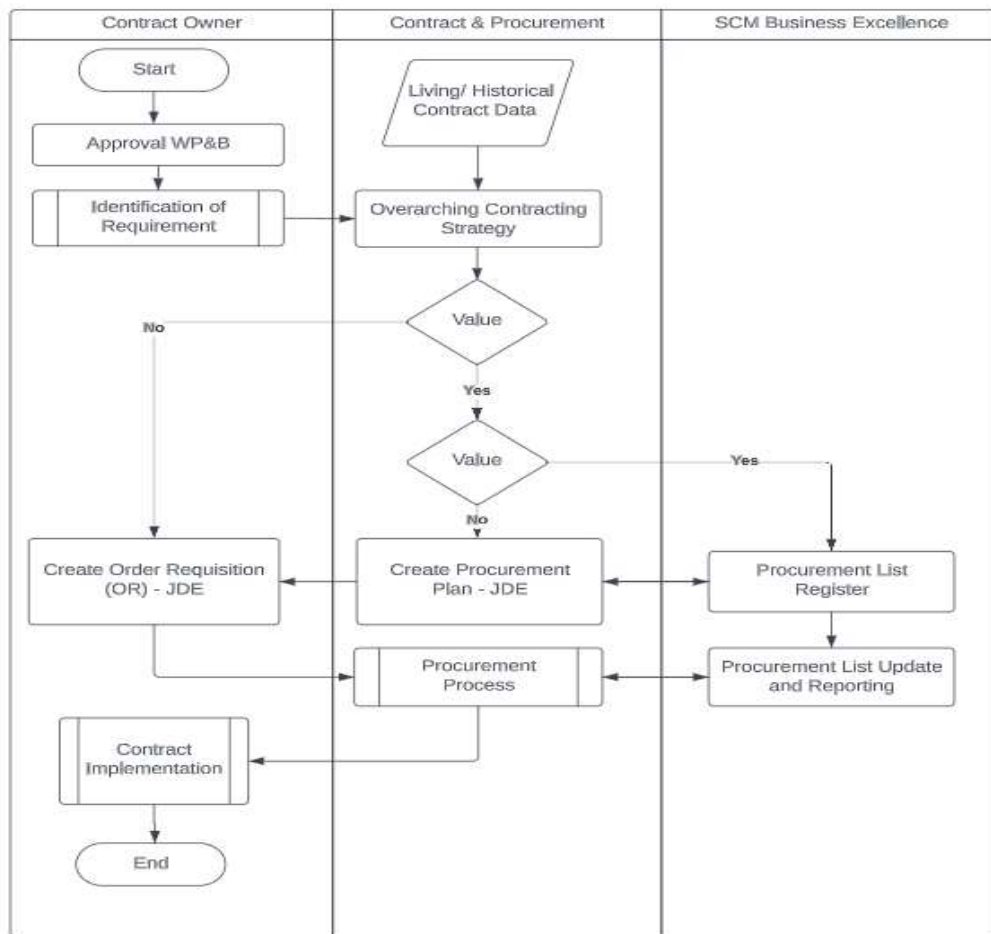
Figure 1. Six Sigma DMAIC Cycle (Source: Google)

The Define phase involves mapping the current process [1]. In the Measure phase, relevant metrics are identified and data is collected [2]. The Analyze phase includes root cause analysis and literature reviews to identify solutions. The Improve phase focuses on implementing the best solutions and gathering stakeholder input. Recommendations are developed based on these findings. The Control phase establishes a long-term strategy in the form of a control chart to prevent recurrence and monitors improvements. Primary data from interviews, secondary data from reports, and literature studies are used to support the proposed improvements [4].

**RESULT AND DISCUSSION**

**A. Define Phase**

The Define Phase, which is the first step in the DMAIC technique, is where the company's contracting, procurement, and contract award processes are identified. This is accomplished by using a process flow chart, which graphically illustrates how materials, energy, and information move through a process. Particularly when the process is complicated the process flow chart aids in the standardization and simplification of complex information. The company's contracting and procurement process flow chart provides a clear visual representation of the process.



**Figure 1.** Contracting and Procurement Process Flow Chart (Source: Author, 2023)

In the company's flow chart for the contracting and procurement process, three parties are often involved the Contract Owner (User), the Contract and Procurement (C&P) function, and Business Excellence (BE) function. The process begins with the identification of requirements, which comprises the development of goods and service requirements as well as an order request from the contract owner. The Contract Specialist from the C&P function will then establish an Overarching Contracting Strategy (OCS) and procurement plan, and the BE function will develop a Procurement List after that. Following that, the procurement process can begin. Once all ongoing contracts have been completed, it will be carried out to completion before the contracts are closed out. The contract award process is a part of the overall procurement process. The flow chart provides a visual representation of this process.

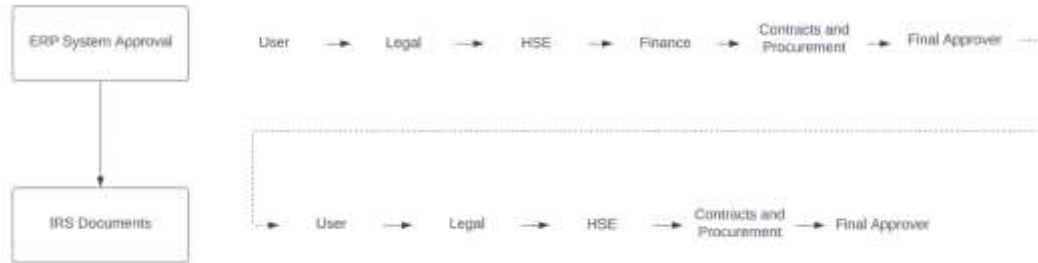


Figure 2. Contract Award Process Flow Chart (source: Author, 2023)

After the contract award process, the contract goes through routing both within and outside the system. The contract signing lead time is set at 30 working days. The company uses an ERP system for system approval and an Internal Routing Slip (IRS) document for the hardcopy contract approval process. The stakeholders involved in the ERP system approval include the User, Legal, Health Safety and Environment (HSE) if there are high risks involved, Finance, Contract and Procurement (C&P) Function, and the final approver. Once all parties have approved the contract on the ERP system, the process moves to the contract approval routing in hardcopy form using the IRS document. The functions involved in this process are generally similar to those engaged in the system approval. The final approver for the contract is determined based on the company's internal regulations and the Delegation of Authority (DOA) threshold. The C&P Manager has the authority to sign contracts with a value up to 500,000 USD, the SCML Senior Manager can sign contracts with a value more than 500,000 USD up to 2 million USD, and contracts with a value exceeding 2 million USD require approval from the President Director, often including the Vice President of Operations' approval beforehand.

**B. Measure Phase**

During this phase, the evaluation of internal routing approval performances will take place. This evaluation will be based on the data collected from all Internal Routing Slip (IRS) processes of the Drilling Campaign Project in 2021, as well as in-depth interviews conducted with the stakeholders involved.



Figure 3. Run Chart of Internal Routing Slip Documents (source: Author, 2023)

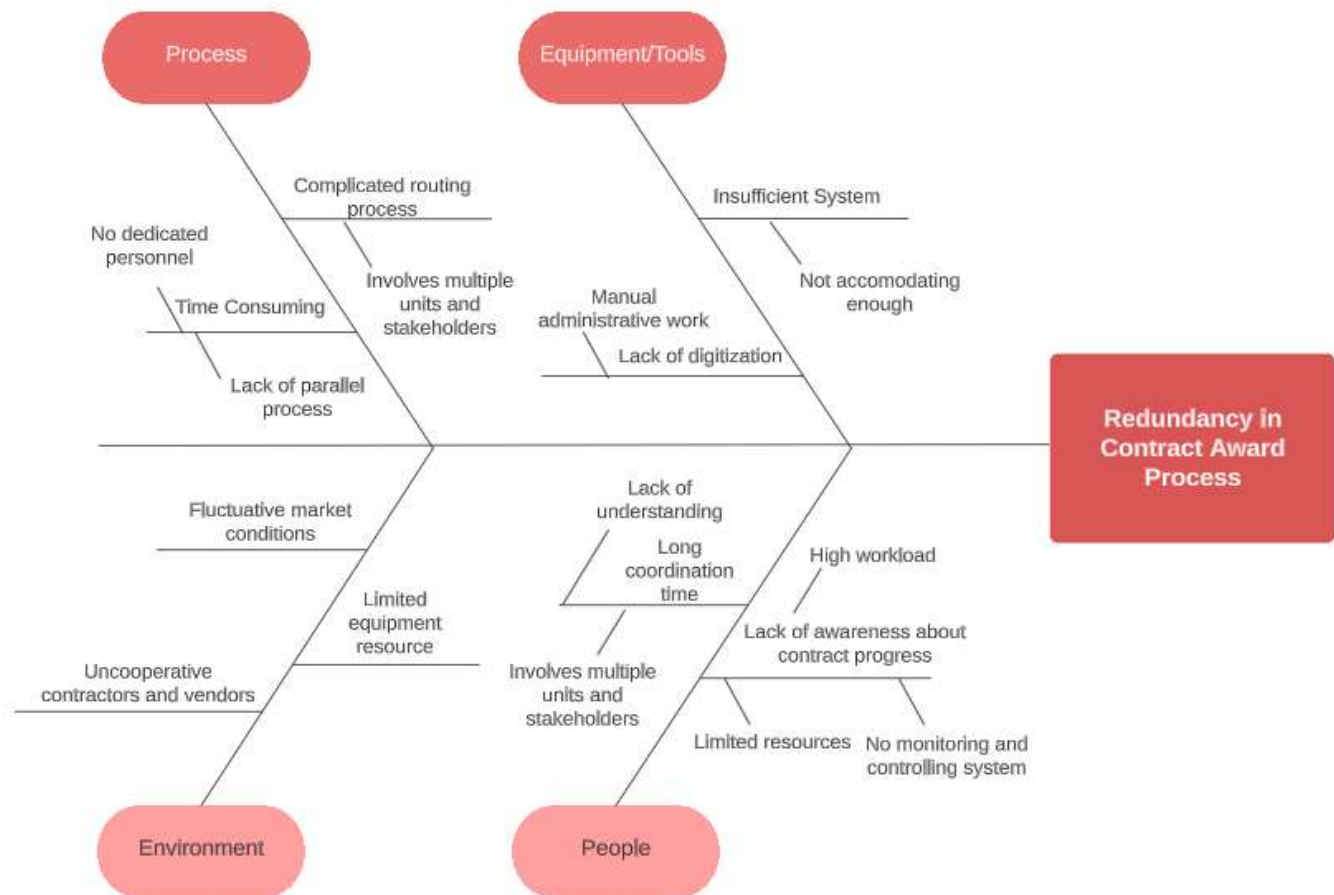
The figure below shows that there are variations in the completion time of IRS documents for the Drilling Campaign Project in 2021. The average completion time is 11 days, which is within the company's target time of 8 days and the target time specified in PTK 007 of 30 days. However, there are instances where the process takes more than 30 days, particularly for contracts with code numbers 1, 4, and 8. Unfortunately, the IRS documents do not provide information on the reasons for the varying signing process

durations. To address this, in-depth interviews with relevant stakeholders are conducted as a qualitative method to understand the factors contributing to the varied completion time of IRS documents for each contract.

**C. Analyze Phase**

The root causes of the issue are discovered through fishbone diagram analysis. The diagram was created using the interview data from the previous section. Based on the findings of the interview, the author creates a fishbone diagram to depict the entire state of the business's contract award procedure. In the fishbone diagram, the following categories were used:

- 1) *People*: Human resources such as the number of personnel, their qualifications, workload.
- 2) *Equipment*: Equipment or tools used in the process.
- 3) *Environment*: External variables and circumstances affecting the contract award process.
- 4) *Process*: The methods, techniques, and processes utilized in the contract award process.



**Figure 4.** Fishbone Diagram (source: Author, 2023)

After the fishbone diagram is developed, the possible root causes from each category are explained below:

- 1) *Process*: Inefficient and time-consuming contract approval routing processes lead to contract delays. The lack of personnel or systems dedicated to contract control and monitoring, along with manual processes, contribute to longer processing times. The complex internal routing process involving multiple stakeholders and limitations on parallel processes further lengthens the overall contract timeline.
- 2) *Environment*: Fluctuating market conditions, uncooperative contractors and vendors, and limited equipment providers affect the contract award process. Contractors and vendors sometimes overlook contract requirements during pre-bid meetings, causing





delays. External factors such as the COVID-19 pandemic disrupt global supply chains, leading to a decrease in service providers, increased logistics costs, and price hikes.

3) *Equipment*: Insufficient digitization and inadequate equipment resources contribute to inefficiencies. Manual administrative work is prevalent, leading to delays and reduced productivity.

4) *People*: Limited personnel in the contracting and procurement function, coupled with high workloads and the absence of a control and monitoring system, result in a lack of awareness regarding contract progress. Long coordination times are observed due to a lack of understanding of contract details and involvement of multiple units or stakeholders.

According to the analysis based on interview results, company data, and the possible root causes from the fishbone diagram, it can be concluded that the root causes to the redundancy in contract award process are as follows:

- 1) *Lack of digitization*
- 2) *No tracking and controlling system*
- 3) *Time consuming process*
- 4) *Complicated routing process*

#### **D. Improve Phase**

The improvement phase will be developed in response to the analysis' findings and in accordance with the root causes found in the previous phase. The author suggests that the company take the following suggestions under consideration in order to address the problems:

1) *Implement a Contract Monitoring and Controlling System*: To improve contract management and operational efficiency, the company proposes the implementation of a centralized command center for all contract-related activities. This system provides real-time access to contract information, keeping stakeholders informed about contract statuses, milestones, and deliverables. It simplifies contract data access and management through a user-friendly interface and offers comprehensive document management capabilities. Automating the approval workflow streamlines the contract approval process, ensuring contracts progress efficiently. The system generates detailed reports and analytics for valuable insights into contract performance. Integration with other platforms allows seamless data exchange. Training and ongoing support are provided to enable effective utilization of the system's features. By implementing this Contract Monitoring and Controlling System, the company aims to improve visibility, coordination, and control throughout the contract awarding process, leading to enhanced contract management and overall operational efficiency.

2) *Streamlining the Contract Approval Routing Process*: To streamline the contract approval routing process, an in-depth analysis of current workflows is needed to identify areas for enhancement. This can be achieved by establishing a standardized approval path with clearly defined responsibilities for each phase. Simplifying approval levels and delegating decision-making authority to lower-level managers can expedite the process and prevent unnecessary delays. Parallel processing can be implemented to enable simultaneous fulfillment of commitments and accelerate approvals. Utilizing digital tools and technology, such as digital approval systems, eliminates manual paperwork, enhances efficiency, and ensures accurate tracking. Effective communication and documentation are crucial to avoid confusion and delays. Providing comprehensive training and clear guidelines to stakeholders involved in the approval process enhances their understanding of roles and responsibilities. Regular assessments and suggestions for continuous process improvement are important to identify further optimization opportunities. By streamlining the contract approval routing process, the company can achieve faster, more accurate approvals, and an overall more efficient contract awarding process.

3) *Digitization of Contracting and Procurement Process*: Digitizing the contracting and procurement processes involves transitioning from manual methods to digital platforms and tools. This includes implementing a comprehensive contract management system that allows contracts to be created, stored, and organized digitally. Automation within digital systems streamlines workflows, sending automatic notifications, reminders, and task assignments to ensure timely completion of contract-related activities. Electronic signature tools offer a secure and efficient way to obtain legally binding signatures, eliminating the need for physical paperwork. Version control within the system ensures stakeholders have access to the most up-to-date contract information. Collaboration and communication tools facilitate effective real-time collaboration, enabling stakeholders to share documents and engage in discussions. The digital system also provides valuable data analysis and reporting capabilities, providing insights into contract performance, compliance, and vendor management. Integrating the digital contract management system with



other internal systems ensures smooth data exchange and consistency. Comprehensive user training and ongoing support are provided to ensure stakeholders can effectively utilize the digital tools. By leveraging digitization, companies can eliminate manual paperwork, streamline processes, enhance data accuracy, and improve the overall efficiency of contracting and procurement processes.

## E. Control Phase

The Control phase focuses on ensuring that the proposed solutions are implemented effectively and can be sustained over time. In this phase, a process control plan is developed to monitor and maintain the improved process. The following steps are involved in creating the control plan:

- 1) *Define objectives*: Clearly define the objectives of the control plan, aligning them with the desired outcomes of the implementation plan. This may include ensuring compliance and monitoring process efficiency.
- 2) *Determine activities*: Identify the specific activities that need to be performed to achieve the objectives outlined in the control plan. This may involve monitoring activities, conducting evaluations, and other necessary tasks.
- 3) *Assign responsibilities*: Define the stakeholders responsible for carrying out each activity to ensure effective execution of the plan. This ensures accountability and clear roles.
- 4) *Determine mechanisms and tools*: Identify the mechanisms and tools that will be used to support the activities in the control plan. This may include data collection and analysis tools, as well as reporting mechanisms.
- 5) *Develop a reporting framework*: Establish a clear reporting framework for documenting the results of control activities and addressing any issues that arise. Define the recipients, reporting format, and support systems for effective communication.
- 6) *Monitor and analyze performance*: Regularly monitor and analyze the performance of the activities outlined in the control plan. Take corrective actions as needed to address any problems or deviations from the desired outcomes.
- 7) *Seek continuous improvement*: Continuously look for opportunities to enhance the effectiveness and efficiency of the control plan. This ensures that the process continues to improve and adapt to changing circumstances.

Regular monthly reviews of the control plan by the C&P Manager, SCM Business Excellence, and SCML Manager or relevant stakeholders are essential. The findings from these reviews can be used to determine if the control plan is effective as it is or requires further improvement. The control plan should be adaptable and allow for ongoing improvements. By implementing this control plan, the company can proactively manage risks, improve efficiency, ensure compliance, and drive further improvement in the implemented processes.

## CONCLUSION

To summarize, the research aims to identify and address the root causes of variation and redundancy in the Contract Award process. Several problems have been identified, including a lack of digitalization, absence of contract tracking and monitoring systems, a complex approval routing process, and a lack of stakeholder cooperation. These issues result in delays, increased costs, and decreased revenue. To improve operational efficiency, three proposed solutions are suggested. Firstly, implementing a contract monitoring and control system that centralizes activities, streamlines workflows, and provides real-time access to information. Secondly, streamlining the Contract Approval Routing Process by establishing standardized paths, delegating decision-making authority, and utilizing digital approval systems. Lastly, digitizing contracting and procurement processes by adopting digital platforms and tools, including a comprehensive contract management system. These proposed solutions should enable the company to improve efficiency, coordination, and control throughout the contract and procurement process. This will lead to faster approvals, accurate decision-making, and increased operational efficiency and profitability.

## RECOMMENDATION

This research has limitations due to its limited scope, data collection, analysis time, and access to confidential company data. The study solely relies on the Lean Six Sigma DMAIC methodology for proposing solutions. Future research should explore alternative methodologies for developing more robust solutions. To enhance the research, future studies can broaden the scope by examining the entire contracting and procurement process in the Indonesian O&G industry, allowing for more comprehensive and beneficial solutions. Comparative analysis of the contract award processes among multiple companies within the industry can be conducted to identify benchmarks for improvement. Additionally, conducting a thorough stakeholder analysis would help identify key



stakeholders' requirements, goals, and challenges, enabling a more personalized and effective application of Lean Six Sigma approaches to address their specific needs.

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