

CHAPTER 3 – RESEARCH METHODS

3.1 Research Flow

This PDCA stands for Plan-Do-Check-Act, and it is a four-step management and continuous improvement framework often used in various industries, including business, manufacturing, healthcare, and more. Developed by Dr. W. Edwards Deming, PDCA is also known as the Deming Cycle or the Deming Wheel. The primary purpose of the PDCA cycle is to promote a structured approach to problem-solving, decision-making, and continuous improvement.

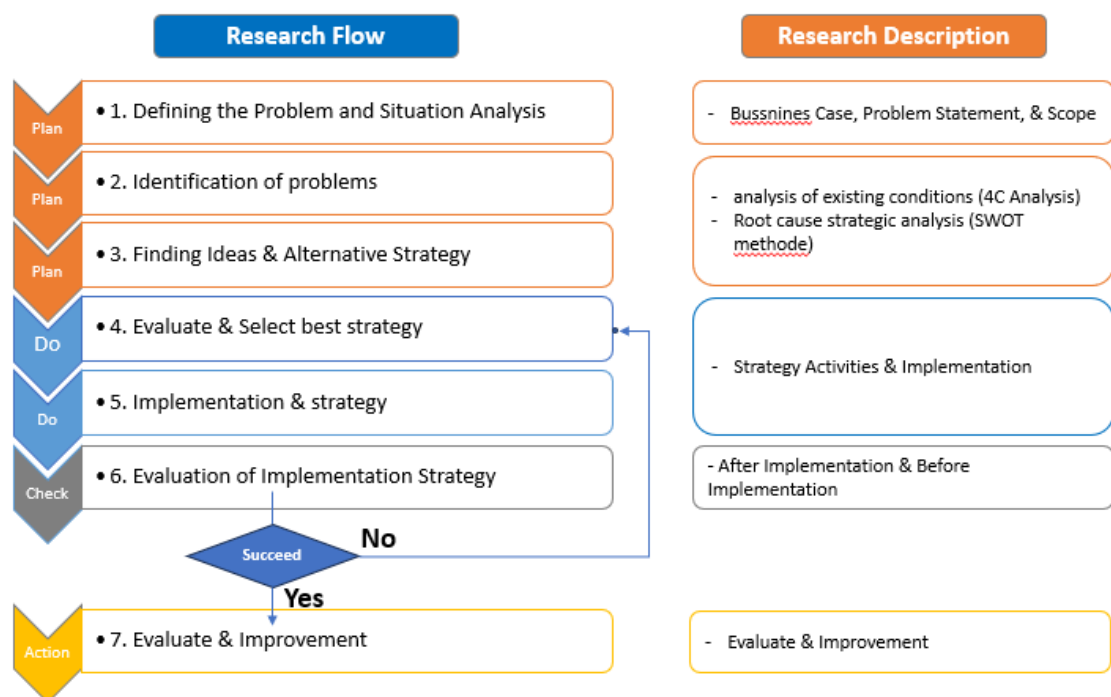


Figure 3.1 Research Flow Process

The PDCA cycle is often depicted as a continuous loop, emphasizing the iterative nature of the process. It encourages organizations to continually seek improvement and adapt to changing circumstances. PDCA promotes a structured and data-driven approach to problem-solving and decision-making, helping organizations to achieve better results, reduce errors, and enhance overall efficiency and effectiveness.

Within the PDCA cycle, the 7 steps are also combined. with the first step defining the problem and situation analysis, then the second step identifying the problem. Then in the third step find the idea and alternative strategy, and then in the 4th step evaluate & select best strategy, and then in 5th do the implementation strategy and the 6th step do the evaluation of implementation strategy. Next, if successful, the process of final step is evaluate the project & improvement.

3.2 Business Model Canvas

Prior to delving into PDCA, let's first introduce the Business Model Canvas. This framework serves as a tool for business management, designed to facilitate the implementation of business strategies. Offering a straightforward structure, the canvas enables a swift visualization of a business idea and its execution plan. Consequently, it provides a more succinct alternative to traditional business plan.

That's why a canvas business model needs to be created to discuss the business ideas you have and develop them. Not only that, but we can also make decisions more quickly whether your business idea is profitable to continue or not. All of this can be seen based on the nine elements it has. The nine elements in the canvas business model are as follows:

1. Customer Segments

The first element of the business model canvas is customer segmentation. So, we need to determine who the customers have the potential to buy our product first. This is important because without clear consumers, our products may not sell on the market.

2. Value Proposition

After knowing who the potential customers are, we need to determine why we need to make this product? What are the benefits for consumers? Well, that's what is called value propositions, namely the value we offer to consumers who will use our products.

In the canvas business model, value propositions can be solutions to problems faced by customers. Either a solution that has never existed before, or a solution with a new, more effective approach. So, try to create unique value.

3. Channels

The channel element in the canvas business model is a means of interaction between customers and our business, either for promotional purposes or to purchase our products and services. Apart from websites, we can use other channels to reach customers such as social media. Social media marketing is suitable for building awareness of the products we sell through various posts that are shared.

4. Customer Relationship

Once we know who the customers are and the channels we will use. It's time to determine how the company communicates with them through customer relationship elements.

This element of the business model canvas helps us choose the best strategy for interacting with customers. The strategy in question is not only when the product is being marketed or during promotions, but also when responding to complaints, and implementing customer retention strategies so that they continue to buy the product.

5. Revenue Streams

Income streams are the source of our business income. In this element we must know where and how the online shop gets its income.

6. Key Activities

Key Activities are elements of the business canvas that explain how our business operations run. Apart from that, key activities also include promotional efforts to make the audience know about our business.

7. Key resources

What is needed for key activities to run? The answer is key resources. We need to determine the appropriate resources needed to carry out our main business activities.

8. Key partner

Key partners are the next element of the business model canvas. This element represents a list of resources outside the company that we need for our business model to function well.

9. Cost Structure

The final element in the business model canvas is the cost structure. This section contains the costs that must be incurred to operate our business. Several elements used to calculate the cost structure are key activities, key resources, and channels.

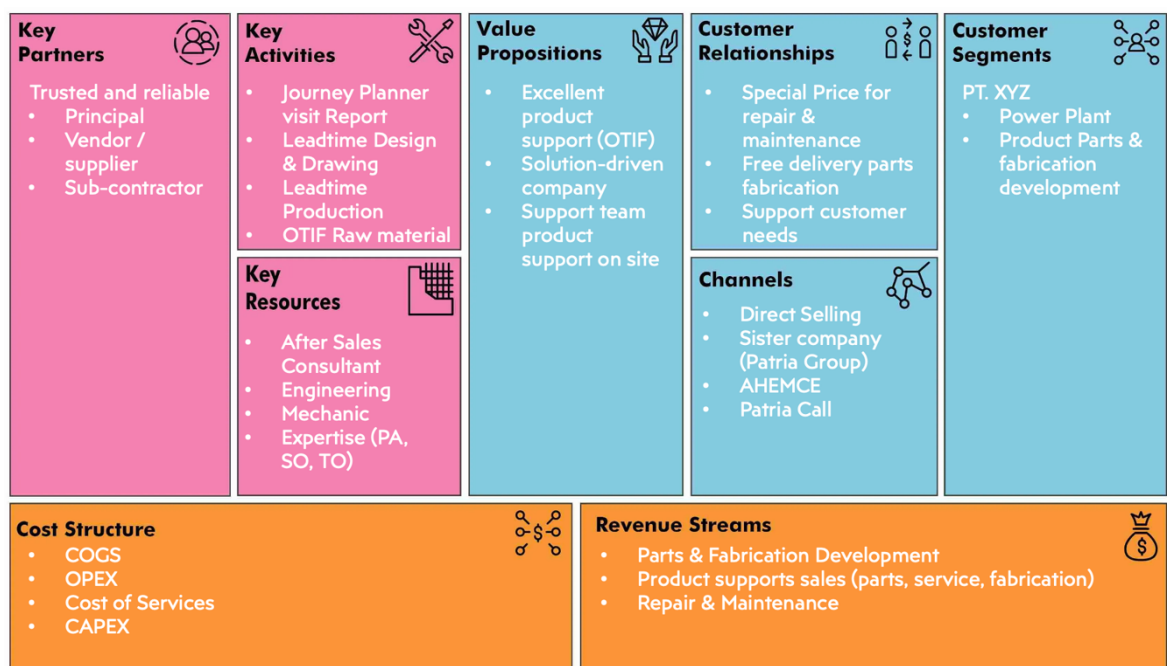


Figure 3.2 Business Model Canvas

The canvas business model above has been adapted to ongoing projects. The customer segment has been adjusted to the conditions where in this project it is PT. XYZ with its main business in power plants, and we as Triatra will guide new customers to offer parts for product development. In Value Propositions, the enthusiasm for the value offered to customers will occur by maximizing existing channels. And the hope is that the revenue stream can be realized in accordance with the specified targets. Then Key Activities are also maximized to make this project a success which is supported by key resources. And the key partner is supported by a sister company as a direct supplier, the hope is that the target can be achieved, customers are happy and the cost structure can be reduced.

3.3 Plan

Plan (P): Identify a problem or opportunity for improvement. Set specific goals and objectives for addressing the problem or achieving the improvement. Develop a detailed plan for how to achieve these goals. This plan should include what needs to be done, who is responsible, what resources are required, and a timeline.

3.3.1 Defining the Problem and Situation Analysis

Identify the problem or imperfection that needs to be addressed. Define the problem clearly and understandably. In finding problems and analysis situations, a method is needed, the method that will be used is SIPOC.

The SIPOC model serves as a visual aid in process improvement and management, offering a concise overview of a process. SIPOC, an acronym for Suppliers, Inputs, Process, Outputs, and Customers, aids teams and organizations in gaining clarity regarding essential process elements. Each component of the SIPOC model represents a distinct aspect.

Suppliers: Serving as the initial phase of the process, this component signifies entities or sources that furnish inputs or resources for the process. Suppliers may originate from within or outside the organization. Examples encompass raw material vendors, information sources, or internal departments providing requisite inputs.

Inputs: Inputs are the materials, information, data, or resources that are received from the suppliers and are used as the starting point for the process. Inputs can be tangible, such as physical components, or intangible, like data or instructions. Identifying inputs is important because they directly impact the quality and efficiency of the process.

Process: This is the central part of the SIPOC model and represents the actual steps, activities, or tasks that transform the inputs into outputs. It outlines the sequence of actions and decisions involved in the process. Understanding the process helps identify bottlenecks, inefficiencies, and opportunities for improvement.

Outputs: Outputs are the results or products generated by the process, which are then delivered to customers. These outputs can be both tangible, such as physical products, and intangible, like reports or services. Defining outputs is crucial because they represent what the process is designed to achieve.

Customers: Customers are the individuals, departments, or entities that receive the outputs of the process. Like suppliers, customers can be internal or external to the organization. Understanding customer needs and expectations is essential for ensuring that the process meets its intended purpose.

The SIPOC model is typically presented as a simple diagram or table, with each of these components listed in columns.

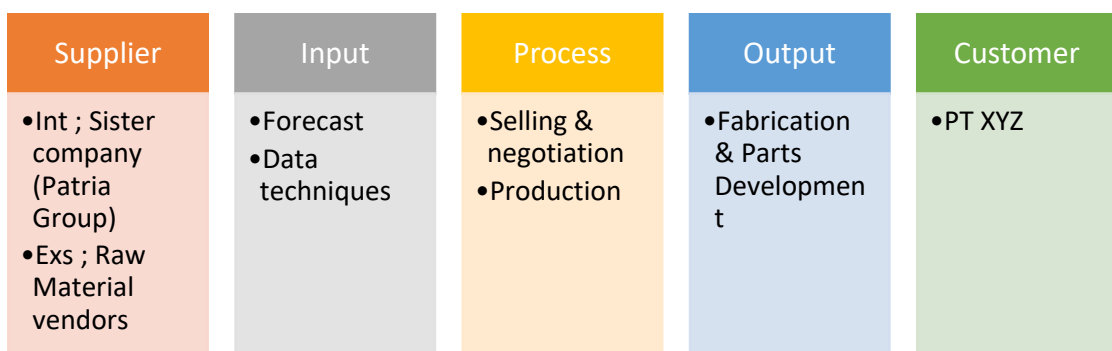


Figure 3.3 SIPOC Colom Model

the following is the planning of the time period activities that will be carried out on this project, as follows.

Table 3.1 Timeline activity

No	Plan Activity		Work Sequence (Month)											
			Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
1	PLAN	1. Defining the Problem and Situation Analysis												
2		2. Identification of Problems												
3		3. Finding Ideas & Alternative Strategy												
4	DO	4. Evaluate & Select Best Strategy												
5		5. Implementation & strategy												
6	CHECK	6. Evaluation of Implementation strategy												
7	ACTION	7. Evaluate & Improvement												

3.3.2 Identification of Problems

Collect data and information regarding the problem. Analyze data to understand the root causes of problems and identify relevant patterns or trends. In the process of identifying problems using the 4C Analysis (Change, Company, Customer, Competitor). It is a strategic analysis tool used by businesses to assess various aspects of their market environment and develop effective marketing strategies. Here's a breakdown of each component:

- **Customer (or Consumer):** This part of the analysis focuses on understanding the target audience or customer base. It involves gathering information about their demographics, psychographics, needs, preferences, and behaviors. Key questions to address include: Who are the target customers? What are their buying behaviors? What are their pain points and desires?
- **Company:** In this section, the company conducts an internal analysis to assess its own strengths and weaknesses. This includes evaluating its products or services, brand reputation, distribution channels, financial resources, and overall capabilities. The goal is to identify what the company does well and where it needs improvement.
- **Competitors:** Analyzing competitors is crucial to understanding the competitive landscape. Identify who the main competitors are, their market share, strengths, weaknesses, and strategies. This helps the company position itself effectively and find opportunities to differentiate from competitors.

- **Change (or Complementors):** Collaborators refer to other organizations or entities that can have an impact on your business. This can include suppliers, partners, distributors, and even complementary businesses that may indirectly affect your market. Understanding these relationships can help identify opportunities for partnerships or potential threats.

The 4C analysis is often used in conjunction with other marketing frameworks like SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis to develop comprehensive marketing strategies. By examining these four key areas, businesses can make informed decisions about target markets, product development, pricing, promotion, and distribution strategies. Below is a 4C analysis of the existing conditions regarding new customers on this project.

Table 3.2 4C Analyst for Project

Change	Customer
1. Freeport contracts permit until 2041. 2. Covid19 subsidies, 3 The big freeport project is being accelerated again, the 3 projects area. 1. SAGmil or mining seed processing machine 2. Gas Power Plant in the Port site area. 3. Smelter factory in Gresik, East Java.	1. With the freeport contract until 2041, PT XYZ's large project will also be sustainable and there will be an increase in new generating projects (PLTG). 2. Opportunity demand PT XYZ for generating systems that various can be provided support by Triatra, proposed product: heat insulation, cooling tower, muffler, adapter, LED lamp, etc. 3. PT XYZ are still repairing their own components fabrication by internal teams and local vendors. 4. PT XYZ customers purchase parts by bidding with local and national vendor participants.

Company	Competitor
- Has standards for overhaul work, fabrication, new product design with specified quality. All products go through a testbench & final inspection process before distribution to customers. - Providing warranty, this aims to guarantee the quality of the products offered to customers. - Has a Design Engineering team that is competent to support new product development. - Support after sales team on site is ready to support (After Sales Consultant & Technical Officer standby on site. - The lead time for procurement of raw materials & parts requires an average of 2-3 months. - The administrative process of purchase order by Head Office approval takes quite a long time.	- The biggest competitor for fabrication and repair is currently PT XYZ itself, because the biggest repair process is still carried out by the internal team. - Current intense competitor parts from local shop. - Local shop parts prices are cheaper than Triatra. - PT XYZ customers have begun to feel the lack of quality in local shop.

3.3.3 Identification of Problems

Based on the 4C analysis, it was derived using the SWOT method to dig deeper into the problem and produce various potential solutions to overcome the root cause of the problem. SWOT stands for Strengths, Weaknesses, Opportunities, and Threats. Here's a breakdown of each component:

- 1) **Strengths:** These are the internal attributes and resources that give an individual or organization a competitive advantage. Strengths can include things like skilled employees, a strong brand, proprietary technology, or efficient processes.

Identifying strengths helps you understand what you do well and how to leverage those advantages.

- 2) Weaknesses: Weaknesses are internal factors that hinder an individual or organization's performance. These can include factors like inadequate resources, poor management, outdated technology, or a lack of necessary skills. Identifying weaknesses is essential for addressing areas that need improvement.
- 3) Opportunities: Opportunities are external factors or trends in the environment that can be advantageous to an individual or organization. These can include emerging markets, changing consumer preferences, technological advancements, or new partnership possibilities. Recognizing opportunities helps you identify potential areas for growth and expansion.
- 4) Threats: Threats are external factors or trends that can negatively impact an individual or organization. These can include competition, economic downturns, regulatory changes, technological disruptions, or shifts in consumer behaviour. Identifying threats allows you to prepare for and mitigate potential risks.

The four elements above are common to all SWOT analyses. However, many analyst further compartmentalize these elements into two distinct subgroups: Internal and External. Internal factors, Typically, Strengths and Weaknesses are considered internal factors, in that they are the result of organizational decisions under the control of company or team. External factors Similarly, customer & competitors would be categorized as a opportunities & threats in a SWOT analysis, but since there's very little we can do about this, this makes it an external factor. This is why may have seen SWOT analyses referred to as Internal-External Analyses or IE matrices. Below in figure 9 are the 4C factors analysis which have been analysis using the SWOT method.

Table 3.3 4C Analyst with SWOT Analyst

Change	Customer
10. Freeport contracts permit until 2041. (Opportunities) 11. Covid19 subsidies, 3 The big freeport project is being accelerated again (Opportunities), the 3 projects area. 1. SAGmil or mining seed processing machine 2. Gas Power Plant in the Port site area. 3. Smelter factory in Gresik, East Java.	1. With the freeport contract until 2041, PT XYZ's large project will also be sustainable and there will be an increase in new generating projects (PLTG). (Opportunities) 2. Opportunity demand PT XYZ for generating systems that various can be provided support by Triatra, proposed product : heat insulation, cooling tower, muffler, adapter, LED lamp, etc. (Opportunities) 3. PT XYZ are still repairing their own components fabrication by internal teams and local vendors. (Threats) 4. PT XYZ customers purchase parts by bidding with local and national vendor participants. (Opportunities)
Company	Competitor
1. Has standards for overhaul work, fabrication, new product design with specified quality. All products go through a testbench & final inspection process before distribution to customers. (Strengths) 2. Providing warranty, this aims to guarantee the quality of the products offered to customers. (Strengths) 3. Has a Design Engineering team that is competent to support new product development. (Strengths) 4. Support after sales team on site is ready	1. The biggest competitor for fabrication and repair is currently PT XYZ itself, because the biggest repair process is still carried out by the internal team. (Threats) 2. Current intense competitor parts from local shop. (Threats) 3. Local shop parts prices are cheaper than Triatra. (Threats) 4. PT XYZ customers have begun to feel the lack of quality in local shop. (Opportunities).

to support (After Sales Consultant & Technical Officer standby on site. (Strengths) 5. The lead time for procurement of raw materials & parts requires an average of 2-3 months. (Weaknesses) 6. The administrative process of purchase order by Head Office approval takes quite a long time. (Weaknesses)	
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3.4 Do

Do (D): Execute the plan developed in the "Plan" phase. Implement the actions and strategies outlined in the plan. Collect data and information during this phase, as it will be used for evaluation in the next step.

3.4.1 Finding Ideas & Alternative Strategy

After integrating the 4C analysis into the SWOT analysis, the subsequent step involves formulating a SWOT strategy based on the identified insights. Through a SWOT analysis, organizations can discern their internal strengths and weaknesses, alongside external opportunities and threats.

This understanding serves as a foundation for devising strategies to leverage strengths, address weaknesses, seize opportunities, and mitigate threats. The ensuing idea generation process entails categorizing the SWOT strategies into four groups for further exploration: SO strategy (Strengths – Opportunities), WO strategy (Weaknesses – Opportunities), ST strategy (Strengths – Threats), and WT strategy (Weaknesses – Threats).

Table 3.4 Finding Ideas by SWOT Strategy

Strategy SO (Strengths – Opportunity)	Strategy WO (Weakness – Opportunity)
1. Penetration to customer PT XYZ. 2. Running routine journey planner. 3. Market analyst for product development. 4. ASC & Engineering collabs visit & follow up inquiry customer. 5. There needs to be an informal & non-technical approach to customers	1. Maintain raw material & available stock. 2. Strengthen Monitoring WIP & raw material management. 3. Collabs weekly meeting with Head office for smoothing documentation process
Strategy ST (Strengths – Threats)	Strategy WT (Weakness – Threats)
1. Make package promotion of development product. 2. Make options to customer as follow up demand, partial repair, full repair, or make new. 3. Optimalization facility workshop for penetration market Development product.	1. Strengthen Development manpower (Technical Officer, Engineering, After sales consultant, Inventory analyst). 2. Schedule mentoring & Training.

From the SWOT strategy table above, clarification is carried out based on the 4M analysis, namely Man, Method, Machine, & Material. This aims to be a process of adjusting whether the strategy that will be implemented can be effective or not, and several intersecting strategies will be combined into one because they can be carried out in parallel together.

3.4.2 Validation & Adjustment

After carrying out the process of finding ideas and alternative strategies, a validation & adjustment process is carried out using the 4M factor method. In the validation &

adjustment process, three Man factors, three Method factors, one Machine, and one material were obtained. From the following eight initiatives, validation & adjustments will be carried out based on the root cause, validation results, then checked & adjusted (valid or not) to the actual conditions.

Table 3.5 Factor 4M Analysis

No.	FACTOR	ROOT CAUSES	VALIDATION RESULT	CHECKED BY	JUDGEMENT
1	Man	Not yet routinely carrying out visits and capturing demand opportunities	Customer visits are still not routinely carried out	Marketing Sales Head	Valid
2	Man	The Engineering Team has not checked demand directly	Data obtained by the Engineering team from ASC & Leader Mech	Tim Engineer	Valid
3	Man	There is no informal approach to customers	New Customer need informal approach	-Marketing Sales Head -Site Operation Head	Valid
4	Method	Not yet running Journey Planner yet	unplanned customer visits	Marketing Sales Head	Valid
5	Method	There is no weekly meeting agenda yet to discuss inquiry requests	the inquiry that can be obtained lost after visiting the customer	Marketing Sales Head	Valid
6	Method	There has been no follow-up discussion regarding follow-up requests with the Head Office	Discussion on follow up demand is still in the Site area	-Marketing Sales Head -Marketing Head Office	Valid
7	Machine	There is no standardization of project monitoring	Project monitoring is still not detailed	-Marketing Sales Head -Site Operation Head	Valid
8	Material	Not Yet management monitoring of fabrication	There is still no standardized monitoring for fabrication and raw materials	-Marketing Sales Head	Valid

3.4.3 Evaluate & Select best Strategy

Evaluate the proposed strategies and select the most appropriate one with reference to predetermined criteria. Consider the positive and negative impacts of each strategy. In the next step, to determine the strategy, carry out a deeper SWOT analysis. To perform a SWOT analysis, you typically follow these steps:

- 1) **Gather Information:** Collect data and information about your organization or situation, including both internal and external factors.
- 2) **Identify Strengths:** Determine what your strengths are by assessing your internal resources and capabilities. What do you do better than your competitors?
- 3) **Identify Weaknesses:** Identify your weaknesses by considering areas where you need improvement or where you may be at a disadvantage compared to others.
- 4) **Identify Opportunities:** Look at external factors and trends that could benefit you. What opportunities exist in the market or environment that you can capitalize on?
- 5) **Identify Threats:** Examine external factors that could pose risks or challenges to your goals. What potential threats could negatively impact your plans?
- 6) **SWOT Matrix:** Create a matrix or table that organizes your findings into the four categories (Strengths, Weaknesses, Opportunities, and Threats) to provide a visual representation of the analysis.
- 7) **Develop Strategies:** Based on the SWOT analysis, develop strategies that leverage strengths to capitalize on opportunities, address weaknesses to mitigate threats, and maximize your overall potential for success.

After validating and adjusting, the next step is the selected strategy, which has been explained above, there are seven points to determine the right strategy for the target. And below is a table for the selected strategy process that will be used.

Table 3.6 Selected strategy implementation

N O	ROOT CAUSES	ALTERNATIV E SOLUTION	THE BASIS OF SOLUTION SELECTION				JUDGEMEN T
			DURA- TION	COST	ADVANTAGE S	DISADVANTAGES	
1	Not yet routinely carrying out visits and capturing demand opportunities	Regular customer visits every week	Weekly	No cost	Can be running every week to the customer	Not effective because there is no priority visit plan for customers	Not Selected
2	The Engineering Team has not checked demand directly	The Engineering Team can be active role in directly visiting customers together with ASC to collect technical data	Biweekly	No cost	Can be running and scheduled with the Journey Planner based on priority demand		Selected
3	There is no Journey Planner schedule yet	Make schedule journey planner	Monthly	No cost	Can be created and can be implemented		Selected
4	Not yet weekly meeting with internal team for discuss inquiry requests demand	Weekly meeting to discuss follow up inquiry demand product development. With Site Team and Head Office participants	Weekly	No cost	Can be running weekly meeting together with the Head Office team		Selected
5	There has been no technical discussion regarding follow up requests with the Head Office	Involving the Head Office in the follow up demand process	Biweekly	No cost	Can be running with Engineering Team Head Office	Can be running with selected number 4	Selected merger point 4 (intersect)
6	Not yet standardization of project	Create standard monitoring of projects from the incoming inquiry	1 Day	No cost	Can be created and can be implemented	Can be running with merger with number 4 & 5, because relationship with head	Selected merger point 4 (intersect)

No	ROOT CAUSES	ALTERNATIVE SOLUTION	THE BASIS OF SOLUTION SELECTION				JUDGEMENT
	monitoring	process to the closing process				office regarding his involvement.	
7	Not Yet monitoring WIP of fabrication management	Create management monitoring of raw material WIP fabrication	1 Day	No cost	Can be created and can be implemented	Not effective because it overlaps with WIP monitoring in the service area	Not Selected
		Create Management monitoring WIP, Development of products that have been drawing, designed & released by the Engineering team based on inquiry requests from customers	1 Day	No cost	Can be create to monitor parts development that has been drawing, designed, & released by the Engineering team		Selected
8	There is no informal approach to customers	Maintain good relationships with customers, create a non-technical and informal approach	Weekly	Fluctuating	Can be running		Selected

In the Selected strategy process, five initiatives were selected, of which there are three intersecting initiatives because they can be combined into one interrelated strategy. With five strategic initiatives to guide new customers, the hope is to provide added value to customers and the company.

After going through the selected strategy implementation, continue with the strategy implementation. Strategy implementation is the act of carrying out a plan to achieve a desired goal or set of goals. The brainstorming process helps formulate these ideas, while the implementation process puts the strategy or plan into action. The strategy implementation process is in the next stage, which is from PDCA to the Check process for the strategy implementation process.

3.5 Check

Check (C): Evaluate and monitor the results of the actions taken in the "Do" phase. Compare the actual outcomes with the expected goals and objectives defined in the "Plan" phase. Analysis any discrepancies or variations between the expected and actual results. Identify the root causes of any issues or variations.

3.6 Action

Act (A): Based on the evaluation and analysis conducted in the "Check" phase, make decisions on what changes or adjustments are necessary. If the results meet or exceed the goals, consider standardizing and implementing the changes on a larger scale. If the results do not meet the goals, determine corrective actions to address the issues, revise the plan, and repeat the cycle.