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AI Model for recycle using energy

1- Background and Business Opportunity:

- Data centers consume large amounts of energy, which leads to the emission of carbon dioxide. It is expected that the need for these centers will increase, which will lead to an increase in environmental problems.

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This project will include how to address environmental problems while taking advantage of data centers and reaching a more sustainable solution for the environment to manage and rationalize water and energy and gain a competitive advantage in the market.

One of the other solutions, in addition to saving energy and water, is the cost of using this service. It is very suitable for all classes and reduces operating costs, which enhances research centers in their attractiveness to customers.

- The business opportunity for this project lies in the increasing demand for sustainable and environmentally friendly solutions. As more companies and individuals become aware of the environmental impact of their operations, there is a growing demand for more sustainable alternatives. By implementing AI algorithms to manage and monitor power and water usage in its data centers, Google can demonstrate its commitment to sustainability and gain a competitive edge in the market.

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- Overall, the proposed project presents a significant opportunity for all Data centers to address its environmental impact and improve its operations, while also demonstrating its commitment to sustainability and gaining a competitive edge in the market.

2-Objectives of the Project:

- **The primary objective :**

Finding safer solutions for the environment to reduce the waste of energy and water

- **Phase 1: Research and Planning**

Conduct research on the current use of energy and water, predict more sustainable ways for the environment, determine the necessary resources and highly qualified employees to complete this idea, and determine the time required to complete the project.

- **Phase 2: Implementation**

- Implementing a project based on data analysis, predictions, and artificial intelligence

- Training employees, monitoring efficiency and effectiveness

- identifying each activity, and knowing the extent to which this activity has reached completion

- **Phase 3: Optimization**

- Analyze data collected from the AI algorithms to identify areas for improvement

- Implement changes to further increase efficiency and reduce environmental impact

- Monitor and evaluate the effectiveness of the changes

- **Phase 4: Expansion**

- Implement the AI algorithms in additional Google data centers

- Scale the project to include other areas of environmental impact, such as recycling and waste management
- Continuously monitor and evaluate the effectiveness of the project

- **In addition to the primary objective,** Reducing energy and water waste and improving profitability

- **1. Cost savings:** Improving the performance efficiency of research centers to ensure environmental safety and reduce waste and energy loss

- **2. Improved efficiency:** The AI algorithms will enable real-time monitoring of energy and water usage, allowing for more efficient management and reduced waste.

- **3. Sustainability:** The company's full commitment to maintaining environmental safety and finding appropriate solutions to ensure energy and water savings

- **4. Competitive advantage:** The ability to compete and attract customers as a result of the price, efficiency and quality of the service, in addition to environmental peace.

- **5. Scalability:** The project can be scaled to include other areas of environmental impact, it is possible to expand the project to include several recycling fields

Overall:

The project's goals are consistent with achieving sustainability, innovation, reducing impact, and enhancing the beneficiary of this service to achieve competitiveness and environmental sustainability

Phase 1: Energy Usage Data Collection and Analysis

Collecting the necessary information to ensure development, as the company using this service will collect all the necessary data regarding the extent of energy consumed by the servers and cooling systems. After that, the data will be analyzed to find out the causes of consumption and try to reduce it and improve use.

Phase 2: Training and Developing Machine Learning Models

The company's engineers, data scientists, and artificial intelligence train the model's necessities through data and careful analysis to ensure increased energy use efficiency. During the model's training period, it will learn to identify problems that stand in the way of environmental sustainability, cover all possibilities and problems to ensure energy and water savings, and predict the temperatures needed for cooling.

Phase 3: Integrating the models with the current infrastructure

Google's computer engineers, software engineers, and AI and ML engineers would integrate the trained model into the currently used infrastructure by Google. AI and ML engineers will merge the model with the current software systems that monitor and manage the data centers. The model will automatically control the existing systems and software. Upgrading hardware will be needed including new computers, thermostats, cooling units, etc.

Phase 4: Deploying and Observing The Models

Publishing models and monitoring their efficiency in reducing energy waste, monitoring the degree of cooling, and taking full responsibility for solving problems to ensure environmental balance.

3- Project Constraints:

To ensure the project's success, it's important to identify and handle its constraints. These encompass:

1. Scope: The scope of the project is to focus only on improving energy and water usage in Google's data centers and achieving sustainability.

2. Risk: The project relies on a technical solution hinged on AI algorithms, which might pose Technical obstacles. Additionally, there's a potential for data privacy and security breaches linked to the gathering and analysis of data on energy and water consumption

3. Communication Plan: To deal with the challenges associated with the technical solution, we will develop a plan to ensure everyone is talking and working together well. This means providing regular updates about the project, getting everyone involved, and setting up feedback methods.

4. Resources: Successfully completing the project right will need employees , tools, resources, and funds.The project team will have to handle these resources carefully, making sure everything is used well, and the project gets done on time and within the planned budget.

How to manage these constraints 🤔?

To manage these constraints, the project team will create a plan to deal with potential problems. This plan will involve recognizing, evaluating, and finding ways to lessen risks. The communication strategy will make sure that everyone involved knows what's happening in the project. Any suggestions or comments from people involved will be taken into account and added to the project plan as necessary. The team will also pay close attention to using resources well, like managing employees and funds, to make sure the project is finished on time and without spending too much.

Overall, by effectively managing the project constraints, the project team can ensure the successful implementation of the project and achieve its objectives of reducing energy and water usage in Google's data centers, while also achieving cost savings and demonstrating the company's commitment to sustainability.

4- How we will manage the risks:

Managing risks is a key part of making any project successful. It's really important to do this well to reach our project goals. Here are some ways we'll manage the challenges tied to our project:

1. Risk identification: The first thing to handle the risks is to find and understand possible issues. The project team will do a thorough check of potential risks, looking at both things inside and outside that might affect the project. This involves pinpointing likely technical problems, pushback against changes, issues with data privacy and security, and other concerns linked to the project.

2. Risk mitigation: Taking actions to reduce the impact of potential problems or challenges on the project.

3. Risk monitoring and control: Continuously monitoring and managing potential issues to

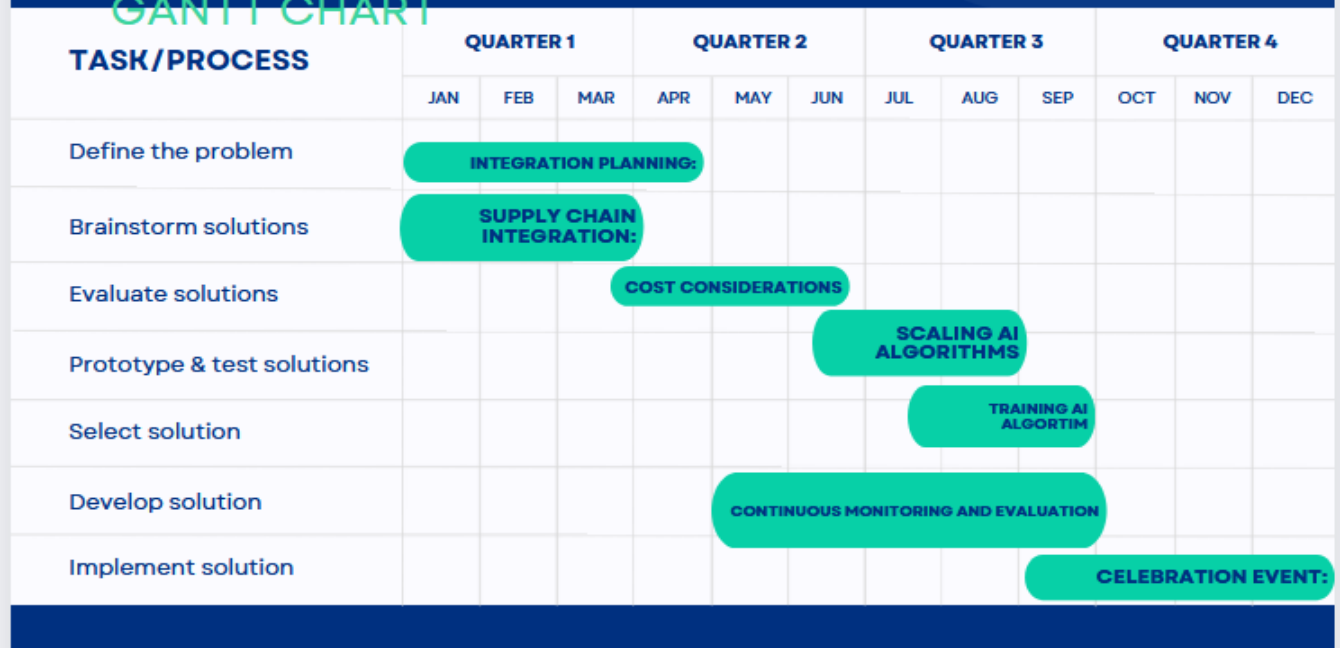
4. Emergency planning: Developing a plan in case of unexpected problems, ensuring a quick

response to keep the project on track. ensure they don't disrupt the project's progress.

Overall, successful risk management plays a crucial role in project success. By spotting, evaluating, and lessening risks, and consistently keeping an eye on and managing them, The project team can ensure completion on time and on budget. This ensures the project meets its goals of cutting energy and water usage in Google's data centers, saving costs, and showcasing the company's dedication to sustainability.

AI Model Recycling Power

GANTT CHART



5- Cost

The costs associated with training implementing the model can be summarized in 3 main sections:

1. The cost of training an AI model on a large scale could reach \$6 million. According to expert estimates, training such models using large-scale datasets could reach approximately \$50million by 2030.
2. Implementing the AI model across all infrastructure within Google's data centers involves integration with existing software and hardware systems, which contributes to additional operational costs.
3. Ongoing costs include maintenance, updating their knowledge bases, and constant monitoring of their performance, all of which are integral to ensuring continuity and relevance of functionality.

5- Cost Estimation

1. **Fixed Cost:**
 - Hypothetical Allocation: \$2 million (33.33% of \$6 million)
2. **Variable Cost:**
 - Hypothetical Allocation: \$2 million (33.33% of \$6 million)
3. **Opportunity Cost:**
 - Hypothetical Allocation: \$1 million (16.67% of \$6 million)

4. Cost Baseline:

- Hypothetical Allocation: \$1 million (16.67% of \$6 million)

Benefits

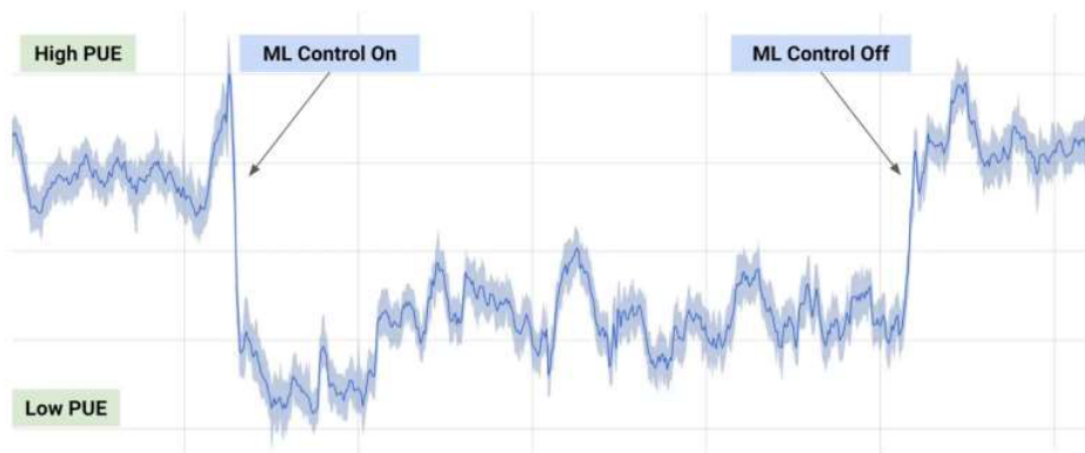
1. Reducing energy consumption: By distributing the workload and terminating unnecessary processes, the model aims to significantly reduce energy consumption across all data centers
2. Sustainability enhancement: The ability to estimate the amounts of water required aligns with the company's sustainability goals, which contributes to reducing the environmental impacts associated with data centers.
3. Reduced cost: Reduced water and energy use results in lower costs, enabling the company to allocate more funds to its expansion and innovation initiatives.
4. Optimized resource usage: Implementation of the model is expected to improve the use of company resources, ensuring efficiency in operations.

As shown in **figure 1** below, the PUE of the data center has dropped by 40% after turning ML control on. PUE stands for Power Usage Effectiveness of data center. The lower PUE, the more efficient the datacenter is in terms of power consumption.

6-Draw the network diagram showing the relationships between different activities. Activities must be at least 30.

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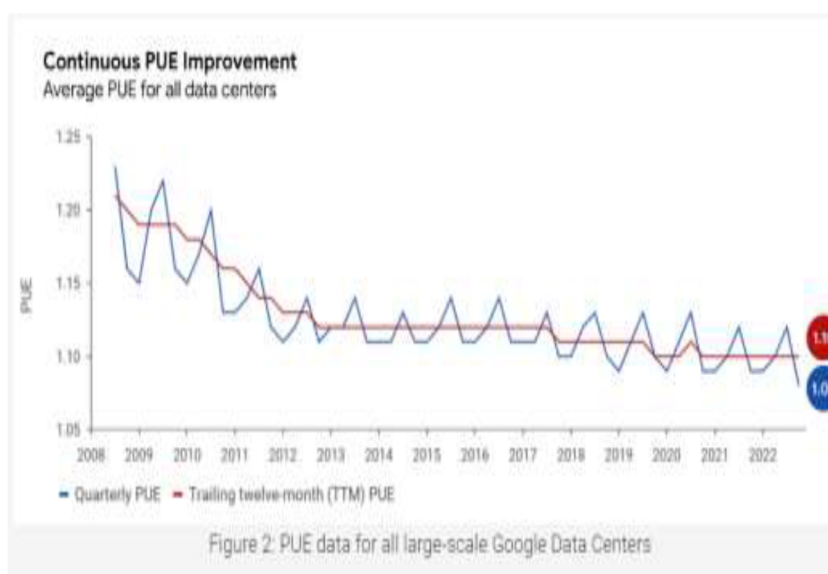
Figure 1

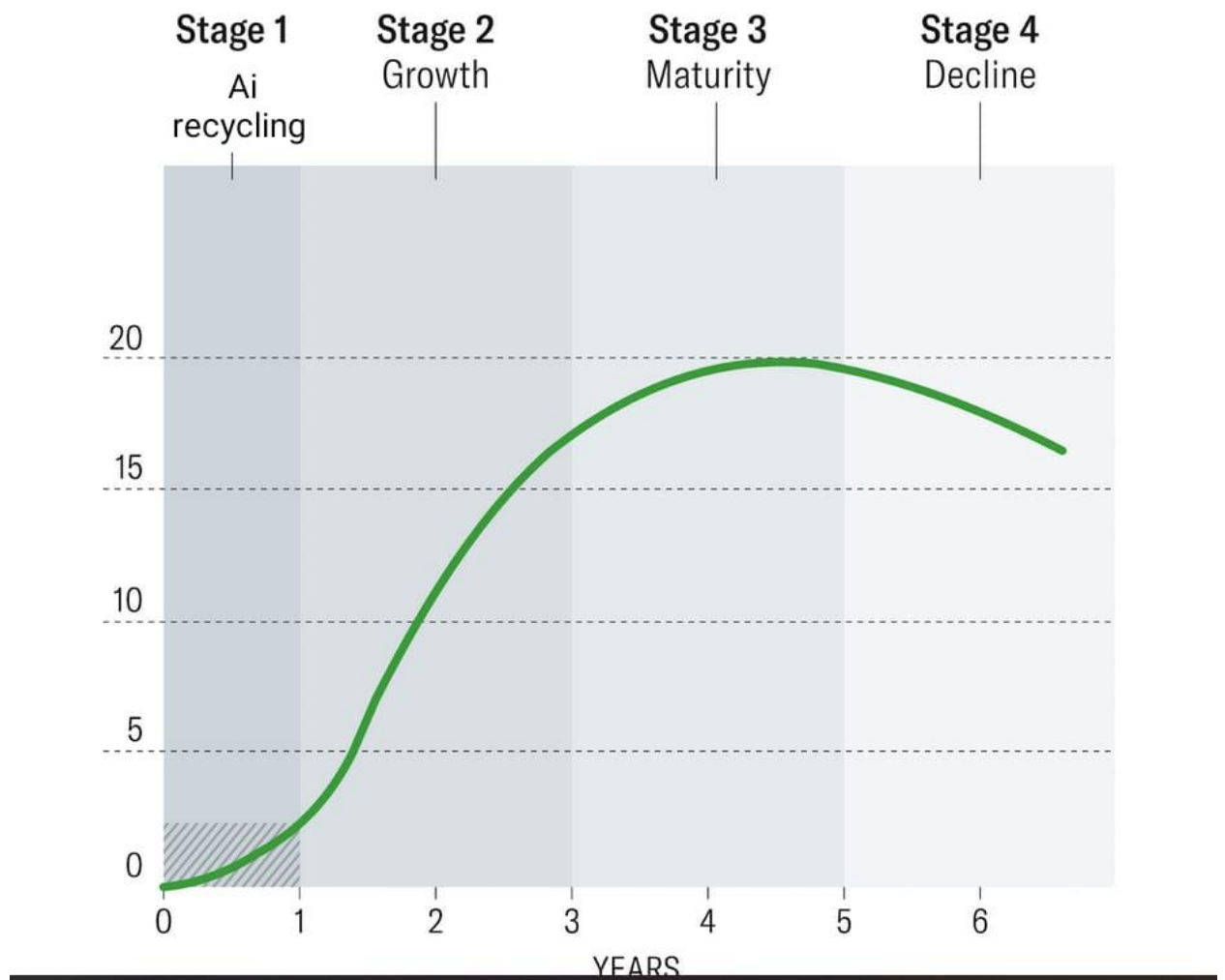


Note. “Change in PUE after turning on ML control in data center”

Also see **figure 2** below. It shows continuous improvement of PUE for all Google’s data centers.

Figure 2:





7- The Logical Framework

It's a planning tool that helps you map out an overview of your project's goals, activities, and expected results in a clear, organized way. It consists of four components: the purpose, goals, outcomes, and assumptions.

1. Purpose: To minimize the environmental impact of Google's data centers by implementing AI algorithms for managing and monitoring power and water usage.

2. Goals: The project has the following goals:

- a. Demonstrate the company's commitment to sustainability.
- b. Reduce energy and water usage in Google's data centers.
- c. Enhance the company's reputation and competitiveness.
- d. Minimize costs for the company.

3. Outcomes: The project has the following outcomes:

- a. AI algorithms are installed and operational in Google's data centers.
- b. Energy and water usage in Google's data centers are reduced by 20%
- c. The company achieves cost savings of \$12 million per year.
- e. The company demonstrates its commitment to sustainability.

4. Assumptions: The project is based on the following assumptions:

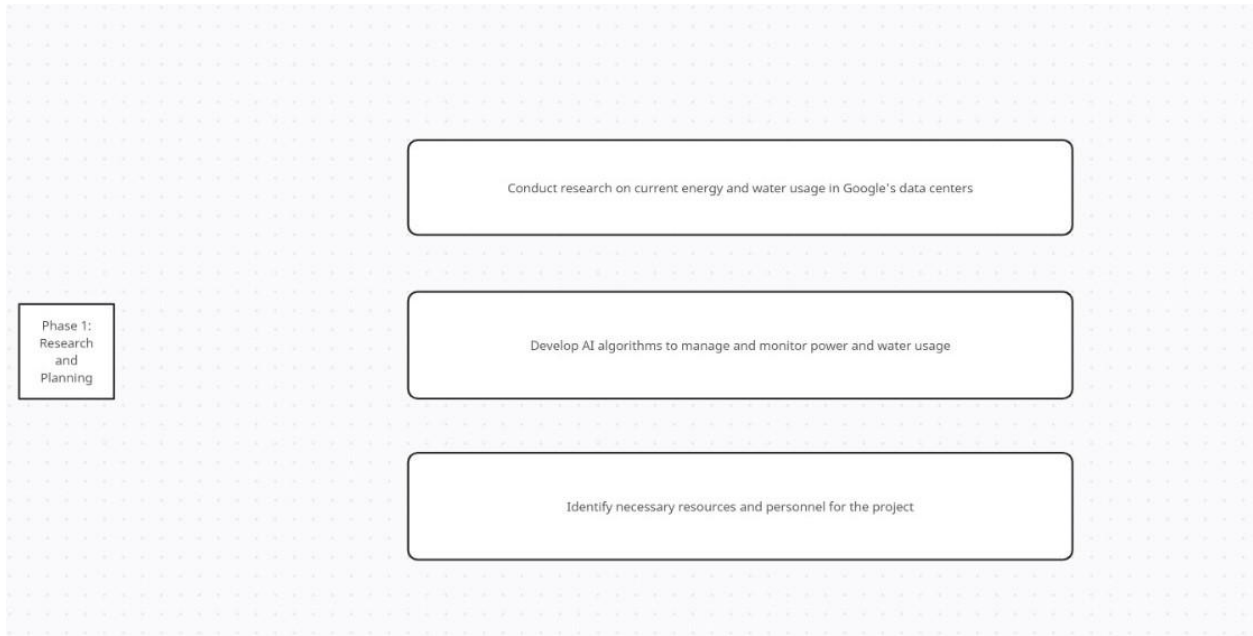
- a. The AI algorithms will be effective in managing and monitoring energy and water usage in Google's data centers.

- b. Employees will receive the necessary training to employ the AI algorithms.
- c. The project will be completed on time and within budget.
- d. The company's stakeholders will be supportive of the project and its goals.

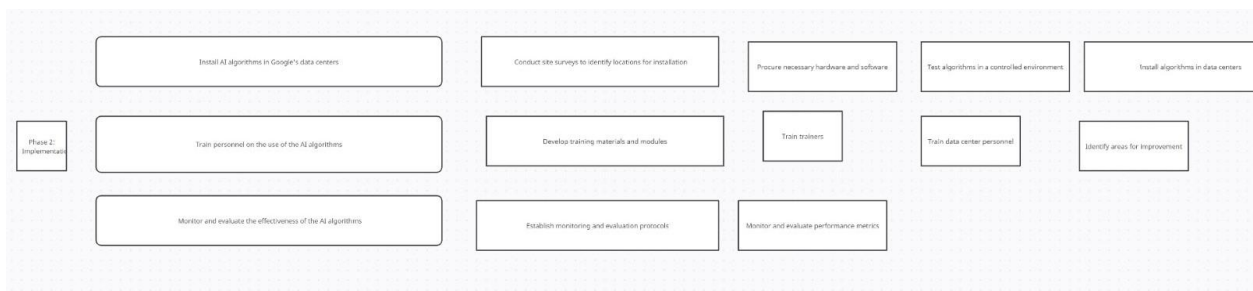
By using the Logical Framework to develop the project strategy, the project team can ensure that all project activities are aligned with the project's objectives and outcomes. The assumptions can also help identify potential risks and challenges that must be addressed to ensure the project's success. In simpler terms, the Logical Framework is like a helpful toolkit for creating a project plan that works.

8. Project KPIs:

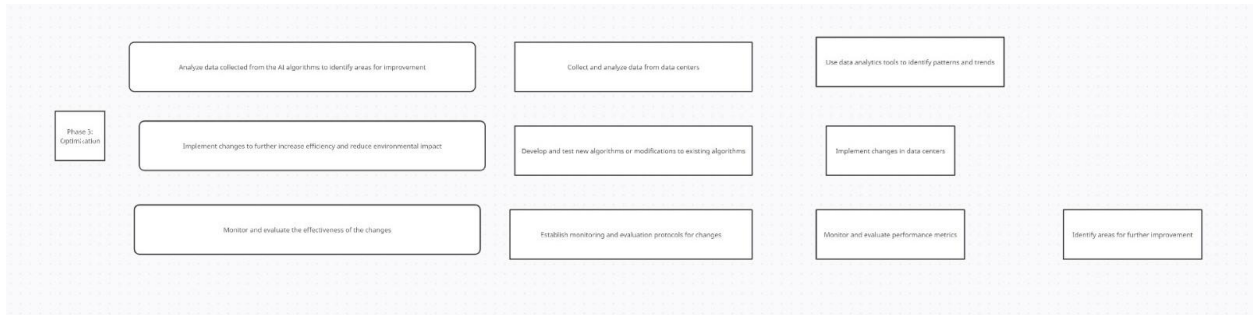
- **Example 1: Accuracy of Trained Model**
 - **Objective:** Ensure the AI model achieves a high level of accuracy in image recognition.
 - **KPI:** Model Accuracy (%)
 - **Measurement Parameters:** Evaluate accuracy on a test dataset using precision, recall, and F1-score metrics.
- **Example 2: Training Time**
 - **Objective:** Minimize the time required to train the AI model.
 - **KPI:** Training Time (hours)
 - **Measurement Parameters:** Monitor the time taken for model training on a regular basis.
- **Example 3: Cost Efficiency**
 - **Objective:** Optimize costs associated with AI model development.
 - **KPI:** Cost per Accuracy Point (\$)
 - **Measurement Parameters:** Calculate the cost-effectiveness by dividing the total project cost by the improvement in accuracy.



phase 2:



phase 3:



phase 4:

