**Retail Industry Project**

**Group B**

**Project Plan for Phase 1: Initial Planning & Design**

**Objective:**

The goal for Phase 1 is to outline the design and gather all the necessary components required for building an AI-based system that predicts demand and optimizes inventory restocking. This phase focuses on problem identification, data gathering, system design, and organizing version control via GitHub.

**Key Focus Areas for Phase 1**

**1. Problem Identification**

* **Main Issue:** Retailers often face two major challenges: too much stock (which leads to high storage costs) or too little stock (resulting in missed sales). Effective inventory management is key to solving this problem.
* **Proposed Solution:** An AI-powered system that forecasts demand and helps businesses make better restocking decisions will balance inventory levels.
* **Benefits:** By predicting future demand, retailers can avoid overstocking or understocking, minimizing storage costs and ensuring products are available when needed.

**Example Statement:**  
"Retailers frequently grapple with overstocking, which leads to excessive storage costs, and understocking, which results in lost sales. Our proposed system will use AI to forecast demand accurately, enabling businesses to optimize restocking and reduce costs."

**2. Identifying Relevant Data**

* **What Data is Needed:**
  + **Sales Data:** Historical sales data to identify trends.
  + **Product Information:** Details like product categories since demand can vary across different types of products.
  + **Seasonal Data:** Information about how sales vary during different times of the year, such as holidays.
  + **Inventory Levels:** Current stock information to help plan the right amount of restocking.

**Example:**  
"We will leverage sales history, product categories, and seasonal patterns to forecast demand. For instance, winter apparel sales may spike during colder months, and we will use this data to recommend appropriate restocking."

**3. Designing System Architecture**

* **Overview of Architecture:** The system should consist of:
  + **Data Input:** Collect data from sources such as sales records and stock levels.
  + **Forecasting Model:** Use models like ARIMA or Prophet to predict future demand.
  + **Optimization Algorithm:** Apply techniques like linear programming to calculate the optimal quantity to restock.
  + **Database:** A central storage system to manage product, sales, and inventory information.

**Example Flow:**  
Data (sales, inventory levels, etc.) is collected → Prediction Model (ARIMA/Prophet) processes the data → Optimization Algorithm calculates restocking → Output is the recommended restocking quantity.

**4. Database Schema Design**

* **Tables to Include:**
  + **Product Table:** Stores information about each product.
  + **Sales Table:** Logs each sale with details like product ID, quantity sold, and date.
  + **Inventory Table:** Tracks current stock levels and when products were last restocked.

**Example Table Setup:**

* **Products Table:**

| **ID** | **Product Name** | **Category** |
| --- | --- | --- |
| 001 | Soap | Hygiene |

* **Sales Table:**

| **Sale ID** | **Product ID** | **Quantity** | **Date** |
| --- | --- | --- | --- |
| 1001 | 001 | 50 | 2024-09-01 |

* **Inventory Table:**

| **Product ID** | **Stock Level** | **Last Restocked** |
| --- | --- | --- |
| 001 | 200 | 2024-08-15 |

**5. Setting Up GitHub Repository**

* **Why GitHub:** Version control helps with team collaboration and maintaining organized project documentation.
* **Repository Structure:** Create folders for:
  + **Data:** Sample datasets and relevant documentation.
  + **Models:** Python scripts that will eventually be used to build the forecasting models.
  + **Docs:** Project documentation such as problem statements, architecture designs, and database schema.
* **Initial Commit:** Add a README file to describe the purpose of the project and setup instructions for team members.

**Phase 1 Deliverables**

* **Problem Statement:** A brief description of how the system will improve inventory management.
* **System Architecture:** A high-level diagram explaining the system’s flow from data collection to generating restocking recommendations.
* **Database Schema:** The design of tables to store data on products, sales, and inventory.
* **Preprocessing Plan:** A strategy for cleaning and preparing the data before feeding it into the forecasting models.
* **GitHub Repository:** A repository containing all the project’s documents and an outline for how to develop models.

**Tools to Use in Phase 1**

* **GitHub:** For version control and project management.
* **Python:** (In the later stages) for developing models.
* **MySQL:** To create and manage the initial database schema for storing sales and inventory data.

**Conclusion for Phase 1**

This phase sets the groundwork for the project by identifying the core problem, outlining the necessary data, designing the system’s architecture, and setting up the GitHub repository. Once completed, Phase 1 ensures that future phases will have a solid foundation for model development and system deployment.