Project Proposal: Term Paper on Supply Chain Optimization for E-Commerce Delivery Logistics

1. Topic Selection

Topic: Optimizing Delivery Logistics for E-Commerce Warehouses.
In the fast-growing e-commerce sector, timely and cost-efficient delivery plays a crucial role in customer satisfaction and operational profitability. Our project focuses on optimizing delivery logistics for ecommerce warehouses to minimize delivery costs and ensure on-time delivery. This study aims to analyze factors like shipment modes, product importance, warehouse block assignments, and discounts offered to identify key drivers of delays and inefficiencies. Efficient logistics systems can significantly reduce costs, improve customer experiences, and enhance competitiveness in the ecommerce industry.

2. Objective of the Problem

The main objective of our project is to:
- **Minimize total delivery costs while ensuring that shipments reach customers on time.**
- Identify the factors contributing to delayed deliveries and improve delivery prediction accuracy.
- Develop recommendations for optimal shipment modes and logistics planning to enhance customer satisfaction.

3. Practical Implications

- **Cost Reduction:** Reducing delivery costs through efficient shipment mode selection and warehouse allocation.
- **Timely Deliveries:** Improving on-time delivery rates to enhance customer satisfaction and loyalty.
- **Operational Efficiency:** Streamlining warehouse operations to handle increasing order volumes.
- **Sustainability:** Lowering carbon footprints by optimizing shipping routes and reducing inefficiencies in logistics.

4. Role of Predictive and Prescriptive Analysis

- Predictive Analysis:
We will leverage predictive modeling to forecast on-time delivery probabilities based on variables such as mode of shipment, warehouse block, product importance, and weight of the product. This analysis will help identify potential delays and improve logistics planning.

- Prescriptive Analysis:

Using optimization techniques, we will recommend the best shipment modes and warehouse allocations to minimize delivery costs while meeting customer deadlines. These insights will guide decisionmaking to enhance logistics efficiency.

5. Known and Unknown Variables

- Known Variables:
- Warehouse block, mode of shipment, customer care calls, customer ratings, cost of the product, prior purchases, product importance, gender, discount offered, weight in grams.
- "Reached on Time" variable (for training predictive models).

- Unknown Variables:
- Future delays in shipments.
- Ideal shipment mode and warehouse allocation for cost reduction.   - Factors leading to variability in customer satisfaction.

6. Objective Function and Limitations

Objective Function:
The project aims to minimize total delivery costs while maximizing on-time delivery rates. Key elements include:
- **Minimizing costs associated with transportation and logistics.**
- Ensuring that delivery timelines are adhered to based on customer needs.

Limitations and Constraints:
- **Warehouse Constraints:** Limited capacity in specific warehouse blocks.
- **Time Constraints:** Delivery time windows must be met to avoid penalties.
- **Shipping Constraints:** Each shipment mode has cost, time, and weight limitations.
- **Operational Variability:** External factors such as weather, traffic, or third-party logistics inefficiencies may influence delivery timelines.

7. Finding a Dataset
We are using a publicly available dataset from Kaggle containing variables like shipment modes, warehouse assignments, product costs, and delivery timelines. This dataset aligns with our objective of analyzing delivery delays and optimizing logistics. It supports predictive modeling to forecast delays and prescriptive analysis to recommend cost-effective logistics strategies.