

# E-commerce Return Rate Reduction Analysis

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## Introduction

Product returns are a critical challenge in e-commerce, reducing profitability and impacting customer trust. This project analyzes return behavior using the **Online Marketplace dataset (Kaggle)** and provides a structured approach with **Power BI data modeling, DAX measures, and dashboards**. The goal is to identify high-risk products, sellers, and customers, and recommend strategies to reduce return rates and improve net revenue.

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## Abstract

The project integrates **Orders** and **Returns** into a star schema with dimensions for Customers, Products, and Sellers. Using DAX, KPIs such as **Return Rate %**, **Net Revenue**, **Avg Lead/Return Days**, and **Risk Score** were created.

An **interactive Power BI dashboard** was built with:

- Overview page (sales, returns, Top 10 products)
- Product & Category drill-through
- Customer & Seller analysis
- Risk Score ranking
- Geographical return hotspots

This enables data-driven decisions to reduce returns, recover revenue, and improve customer satisfaction.

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## Tools Used

- **Power BI** → Schema design, DAX measures, dashboards
  - **Dataset** → Online Marketplace dataset (Kaggle)
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## Steps Involved in Building the Project

### 1. Data Preparation

- Imported dataset into Power BI.
- Cleaned data (duplicates, missing values).
- Split into tables: Orders, Returns, Customers, Products, Sellers.

### 2. Schema Design

- **Orders** (FK: OrderID; FKs: CustomerID, ProductID, SellerID) → central fact table
- **Returns** (PK: OrderID)

- **Customers** (PK: CustomerID), **Products** (PK: ProductID), **Sellers** (PK: SellerID)

### 3. DAX Measure Creation

KPIs: Total Orders, Sales Revenue, Returned Orders, Return Rate %, Net Revenue, Avg Lead/Return Days, Customer Metrics, Product/Seller Return %, Return Risk Score, High-Risk Products count.

### 4. Dashboard Development

The Power BI dashboard was designed with five interactive pages to analyze returns from multiple perspectives:

- **Overview Page** → Displays key KPIs (Orders, Sales, Returns, Net Revenue), sales vs. returns trend, and Top 10 Products by total orders.
- **Product & Category Page** (Drill-through) → Allows deep dive into product and category-level return rates, seller breakdown, and monthly product trends.
- **Customer & Seller Analysis Page** → Highlights customer return behavior, frequent returners, and seller performance with comparative metrics.
- **Risk Score Analysis Page** → Ranks products by calculated Return Risk Score, identifies high-risk items, and compares risk against net revenue.
- **Geographical Analysis Page** → Maps regional return rates, highlights top return regions, and shows contribution of urban markets to total returns.

### 5. Insight Generation

- Top 10 products = 60% of sales, 40% of returns.
- Electronics & Fashion = 2× average return rate.
- 5% frequent-return customers = 25% of returns.
- 8% of sellers = 30% of returns.
- \$200K lost revenue due to returns.

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### Conclusion

The analysis reveals:

- Top-selling products and categories also drive most returns.
- A small group of repeat customers and underperforming sellers create disproportionate losses.
- Electronics and Fashion dominate return risk.
- Returns are concentrated in urban regions.
- Net revenue loss is ~\$200K.

By targeting **high-risk products**, **problematic sellers**, and **frequent-return customers**, businesses can reduce return rates, recover revenue, and improve customer satisfaction.