Anomaly Detection Dashboard

Project Report

Prepared By: Lokesh Reddy Sontireddy

Date: August 2025

Executive Summary

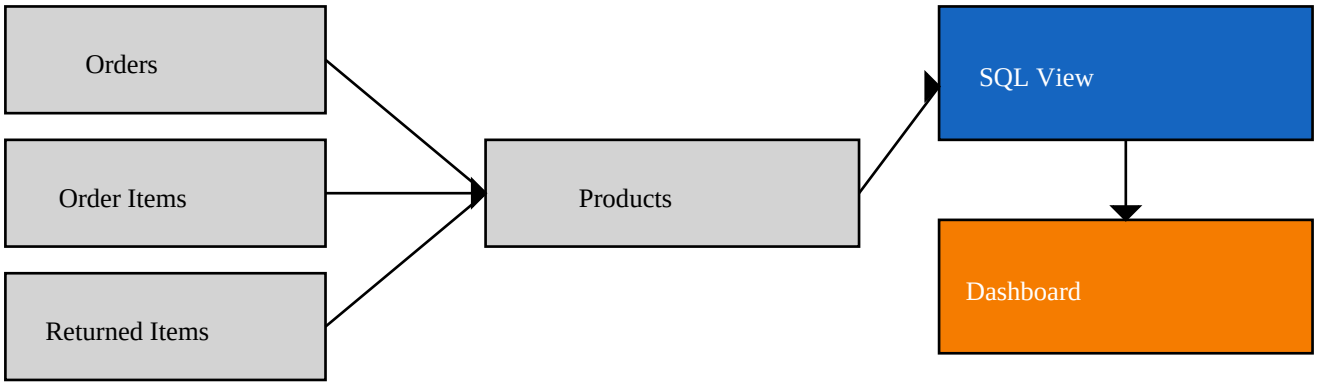
In today’s competitive environment, product returns are not just a cost — they are a signal. High or unusual return patterns can indicate usability problems, defects in product quality, or issues in logistics. If left unchecked, these patterns lead to customer dissatisfaction, operational inefficiencies, and revenue leakage.

Our task was to build an anomaly detection system that could automatically highlight products with abnormal return behavior. To achieve this, we connected sales and return data across multiple sources — orders, order items, product catalog, and return records — and created a consolidated SQL view. This view calculates sales, returns, return rates, categorized return reasons, and anomaly flags.

The dashboard built on top of this view presents a clear, interactive interface for both technical and non-technical stakeholders. Users can filter by brand or product name, view overall sales and return KPIs, and drill down into specific anomalies. Charts highlight the worst-performing products and the breakdown of reasons behind their returns.

This approach provides an early warning system: UX surges reveal usability gaps, defect surges highlight quality issues, and logistics surges point to shipping or handling inefficiencies. By centralizing this information, Product, QA, and Operations teams can act faster and address problems before they grow.

Data Flow


Orders
Order Items
Returned Items
Products
SQL View
Dashboard

Return Reason Categories

Return reasons were grouped into four categories to simplify analysis and make insights actionable. These categories were chosen because they align with how responsibilities are divided across teams: Product, QA, and Operations.

UX Issues

Complex UI, Incompatible, Setup difficult, Documentation confusing

These indicate usability or documentation problems, and suggest product design improvements are needed.

Defects

DOA, Overheating, Screen issue, Battery drain

These point to product quality issues. Frequent defects trigger QA investigations and supplier reviews.

Logistics

Damaged in transit, Underpowered supply

These highlight packaging, shipping, or fulfillment inefficiencies. Operations teams need to act here.

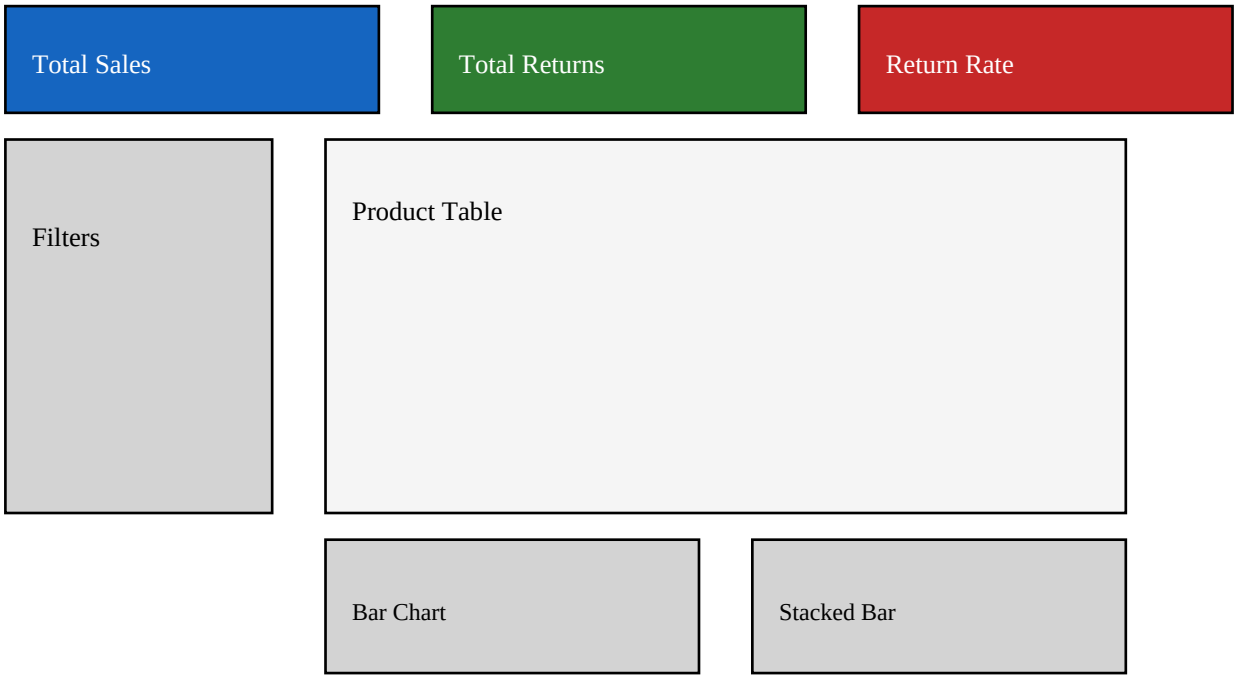
Other

Anything else not classified

This category acts as a catch-all. It captures rare, unexpected, or currently unmapped reasons for returns.

Dashboard Layout (Mockup)

The dashboard highlights KPIs at the top, filters on the left, a detailed product table in the center, and charts at the bottom-right.



Example Insights (Dummy Data: Aug 1–21)

From the dummy dataset, we observed several different types of anomalies and baseline behaviors. Each example below illustrates how the dashboard flags and contextualizes potential problems:

• UX Surge — The iPhone 16 Pro showed a return rate of 25%, with 3 of 4 returns citing 'Complex UI'. This signals usability and onboarding issues. The Product team should prioritize design review sessions, update tutorials, and conduct usability testing with new customers to address these friction points.

• Defect Surge — The SpectraForce GPU had a 40% return rate, primarily driven by repeated complaints of 'Overheating'. This pattern points directly to a product quality problem. QA should escalate this to engineering and suppliers, validate whether it affects all units or a specific batch, and prepare a corrective action plan.

• Logistics Issue — The Arduino UNO experienced several returns flagged as 'Damaged in Transit'. While the overall return rate was moderate (10%), logistics-related returns indicate problems in shipping or packaging. Operations teams should audit packaging standards, courier handling, and review vendor SLAs.

• Baseline Product — The Raspberry Pi 4 sold 8 units and had only 1 return (12.5%), well within acceptable norms. No anomaly flags were triggered, marking it as a stable product. Baseline products like these are crucial for comparison, helping to distinguish genuine anomalies from normal fluctuations.

Insights for Stakeholders

The anomaly detection system provides value only if its signals lead to clear action. Here’s how each team benefits and what they should focus on:

■ Product Team

UX anomalies point directly to issues in customer experience. When flagged, the Product team should conduct usability sessions, improve documentation, enhance onboarding guides, and potentially redesign confusing interfaces. Reducing UX-related returns strengthens customer satisfaction and retention.

■ QA Team

Defect surges expose quality control gaps. QA teams should treat these anomalies as red alerts, launch immediate investigations, coordinate with suppliers, and perform root cause analysis. Early detection prevents further distribution of faulty units and minimizes reputational damage.

■ Operations Team

Logistics anomalies highlight breakdowns in packaging, warehousing, or courier handling. The Operations team should audit packaging protocols, retrain logistics partners, and track courier performance metrics. Addressing these quickly prevents avoidable costs and builds trust with customers expecting reliable delivery.

By aligning insights with responsible teams, the dashboard ensures that anomalies don’t remain abstract signals but are translated into specific corrective actions across Product, QA, and Operations functions.

Note:

Future enhancements include dynamically choosing the date range by giving the required rane while running the view and including the date filter in the dashboard.

Dashboard Link: https://lookerstudio.google.com/reporting/4855c65d-471a-438b-a639-3bcf77470768