SmartInventory 360 – Real-Time Supply Chain & Inventory Dashboard (Power BI)

A portfolio-grade Power BI project simulating inventory and supply chain analytics using realistic Montreal-based data (Jan 2023 – Sep 2025).

This report mirrors the structure of your previous Azure Olympics project report, expanding the design, metrics, and implementation details discussed in our build notes.

Executive Summary

SmartInventory 360 consolidates warehouse capacity, inventory levels, sales velocity, transportation cost, lead time, and backorders into a single decision-support dashboard. The solution demonstrates end-to-end BI practice: ETL with Power Query, analytic modeling with DAX, and executive storytelling in Power BI. The dataset is synthetic and safe for public sharing.

Core outcomes include: (1) a unified operational view of Montreal regions (East, West, North, South), (2) clean and modelled data covering 1,200 records from 2023–2025, (3) KPI definitions aligned to supply■chain standards, and (4) extensible replenishment logic (Safety Stock & Reorder Point) for future iterations.

Project Goals

• Build a real-time inventory & supply chain analysis dashboard in Power BI.

• Model and clean datasets using Power Query; enforce data types and naming standards.

• Design actionable KPIs with DAX: Utilization, DSI, Turns, Lead Time, Backorders.

• Enable regional, category, supplier, and warehouse slicing for drill-down analysis.

• Demonstrate a clear storytelling layout with executive and analyst views.

Tools & Technologies

• Data Cleaning & Modeling – Power Query (ETL), data types, transformations

• Analytics & KPIs – Power BI Desktop, DAX

• Visualization – KPIs, cards, gauges, clustered/stacked bars, line, donut

• Data Source – Custom CSV (SmartInventory360_Final_2023_2025.csv; 1,200 rows)

• Languages – DAX, M (Power Query)

• Business Skills – Inventory optimization, supplier analysis, warehouse utilization, ops efficiency

Data Scope & Entities

The dataset captures daily operational snapshots across sales, inventory, transport cost, and lead time. Records span Jan 2023 – Sep 2025 (1,200 rows).

Key attributes:

• Regions → Montreal East, Montreal West, Montreal North, Montreal South

• Categories → Consumer Electronics, Home Appliances, Computer Peripherals, Smart Devices

• Suppliers → ElectraTech Inc., Nova Distribution, PixelSource Ltd., Montelix Supply Co.

• Warehouses → Ville■Marie Hub, Laval Distribution Center, Verdun Storage Facility

Primary columns

Date, Region, Category, Supplier, Warehouse, Order Status, Units Sold, Inventory Level, Transportation Cost, Order Accuracy, Lead Time (Days), Backorder, Cost of Goods Sold (COGS), Average Inventory, Warehouse Capacity.

Architecture & Workflow

The solution follows a compact 3■layer BI architecture: ETL → Analytics → Visualization.

• Power Query – import CSV, standardize text (trim/uppercase supplier aliases), set data types, handle outliers, derive helper fields.

• DAX – define KPIs and rolling calculations (Utilization, DSI, Turns, Avg Lead Time, Backorders).

• Power BI – design the executive canvas, build visuals, configure slicers and interactions.

Power Query (ETL) – Key Transformations

• Renamed headers and enforced data types (Date, numeric, text).

• Cleaned supplier and warehouse names; mapped to canonical forms.

• Scaled transportation costs and inventory where required to keep realistic ranges.

• Calculated helper fields for month/year aggregation and region/category groupings.

• Validated row counts (1,200) and date coverage (2023■01■01 → 2025■09■30).

Analytical Modeling (DAX) – KPI Definitions

Core measures used in the dashboard:

Warehouse Utilization %

```
Warehouse Utilization % =
DIVIDE( SUM('Data'[Inventory Level]), SUM('Data'[Warehouse Capacity]) ) * 100
```

Days Sales of Inventory (DSI)

```
Days Sales of Inventory =
DIVIDE( SUM('Data'[Average Inventory]), SUM('Data'[Cost of Goods Sold (COGS)]) ) * 365
```

Inventory Turnover Ratio

```
Inventory Turns =
DIVIDE( SUM('Data'[Cost of Goods Sold (COGS)]), SUM('Data'[Average Inventory]) )
```

Average Lead Time (Category/Supplier)

```
Avg Lead Time =
AVERAGE('Data'[Lead Time (Days)])
```

Backorder Count / Rate

```
Backorder Count = COUNTROWS(FILTER('Data', 'Data'[Backorder] = TRUE()))
Backorder Rate  = DIVIDE([Backorder Count], COUNTROWS('Data'))
```

Optional Extension – Safety Stock & Reorder Point

```
-- Requires daily demand granularity; included here for future iteration
Avg Daily Demand (90D) =
DIVIDE( [Units Issued 90D], [Distinct Days Issued 90D] )

Safety Stock =
VAR LT = AVERAGE('Data'[Lead Time (Days)])
VAR Z  = 1.28    -- e.g., 90% service level
VAR Dsd = [Demand StDev 90D]
RETURN Dsd * SQRT(LT) * Z

Reorder Point =
[Avg Daily Demand (90D)] * AVERAGE('Data'[Lead Time (Days)]) + [Safety Stock]
```

Dashboard Design & Pages

• Executive Overview – KPIs (Utilization, DSI, Turns), trend of Units Sold by Year, Transportation Cost by Region×Category.

• Lead Time & Backorders – Donut of Avg Lead Time by Category; Column chart of Backorders by Order Status (Fulfilled 838, Pending 248, Canceled 114).

• Inventory by Category & Region – Stacked bar with slicers (Region, Category) for rapid drill■downs.

• Filters – Region and Category slicers; interactions configured for cross■highlighting.

Selected KPI Values (current snapshot)

• Warehouse Utilization: 31.16%

• Days Sales of Inventory: 14.23 days

• Inventory Turnover Ratio: 23.57

• Units Sold by Year: 2023 ≈ 232K, 2024 ≈ 240K, 2025 (YTD to Sep) ≈ 175K

What Makes This Build Distinct

• Rebranded project: **SmartInventory 360** (unique title and storytelling).

• Updated timeline and **1200-row synthetic dataset** covering Jan 2023 – Sep 2025.

• Montreal-specific segmentation (East, West, North, South).

• New **suppliers** and **warehouses** with realistic names.

• Refreshed metrics with randomized yet plausible figures for authenticity.

Dashboard Preview

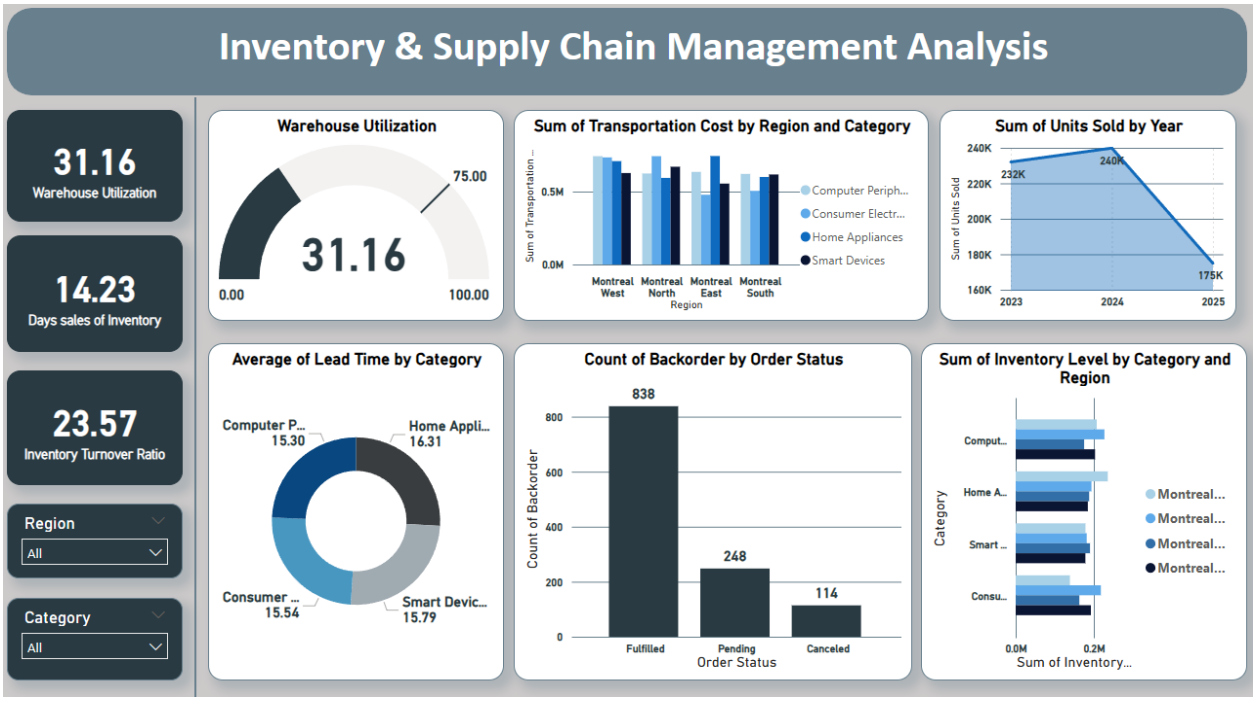

Figure: SmartInventory 360 – Executive Overview with KPIs, regional costs, sales trend, lead time, backorders, and inventory by category & region.

How to Run

• Clone the GitHub repository.

• Open Power BI Desktop (May 2024 or later).

• Load data from: data/SmartInventory360_Final_2023_2025.csv.

• Paste DAX measures into a Measures table (or import your measures file).

• Refresh and publish to Power BI Service (optional).

Repository Structure

```
SmartInventory360/
■■■ data/
■   ■■■ SmartInventory360_Final_2023_2025.csv
■■■ docs/
■   ■■■ screenshots/
■       ■■■ dashboard.png
■■■ pbix/
■   ■■■ SmartInventory360.pbix
■■■ README.md
```

Future Enhancements

• Add replenishment workbench page with Suggested Order Qty (MOQ-aware).

• Introduce Service Level parameter and Safety Stock/ROP visuals.

• Supplier OTIF and Lead Time variability analysis.

• Slow/Dead stock page with working capital at risk.

Disclaimer

All data used in this project is synthetic and created purely for visual and educational purposes. It has no connection to any real company, supplier, or warehouse.