Made by Ahmed Elbahrawy
This project involved the end-to-end design and implementation of a complete Data Warehouse (DWH) solution using the Microsoft BI stack. Centered around a fictional bicycle sales operation, the goal was to enable advanced analytics and executive-level reporting for sales, inventory, and operational efficiency.
The project followed best practices in data modeling, ETL development, and visualization, and was built using the Medallion Architecture: ODS → STG → DWH.

Tools Used:

- **Azure SQL Server (Data Source)**
- **SQL Server Management Studio (SSMS)**
- **SQL Server Integration Services (SSIS)**
- **SQL Server Analysis Services (SSAS)**
- **Power BI**
- **Visual Studio 2019**

Conceptual Model

The data model was designed using the star schema principle, separating facts from dimensions to support analytical querying.

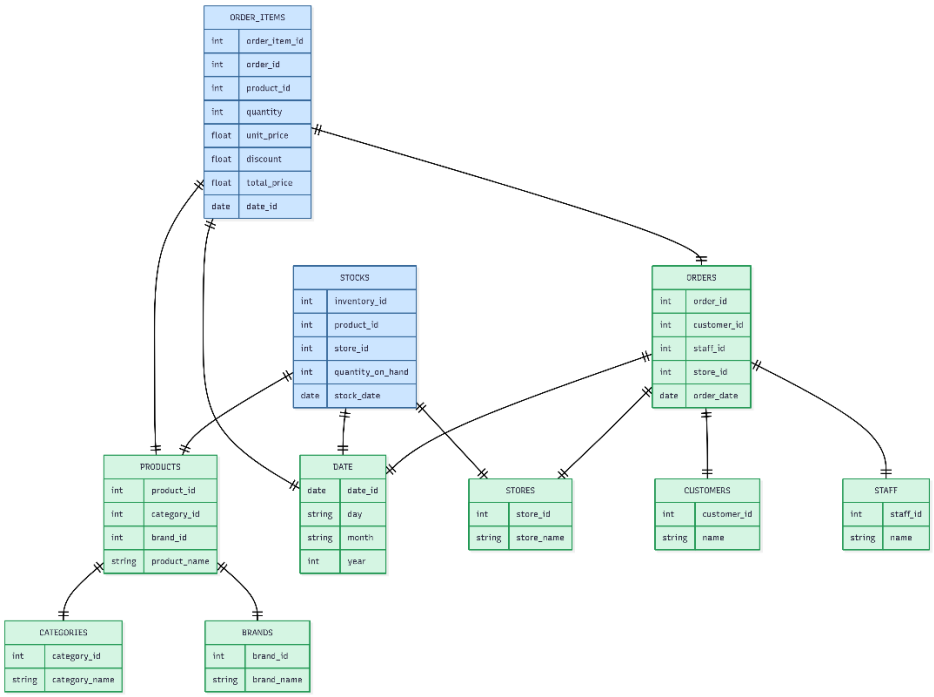
Fact Tables:

- **fact_order_items**
- **fact_stocks**

Dimension Tables:

- **dim_products**
- **dim_categories**
- **dim_brands**
- **dim_customers**
- **dim_stores**
- **dim_staff**
- **dim_date**

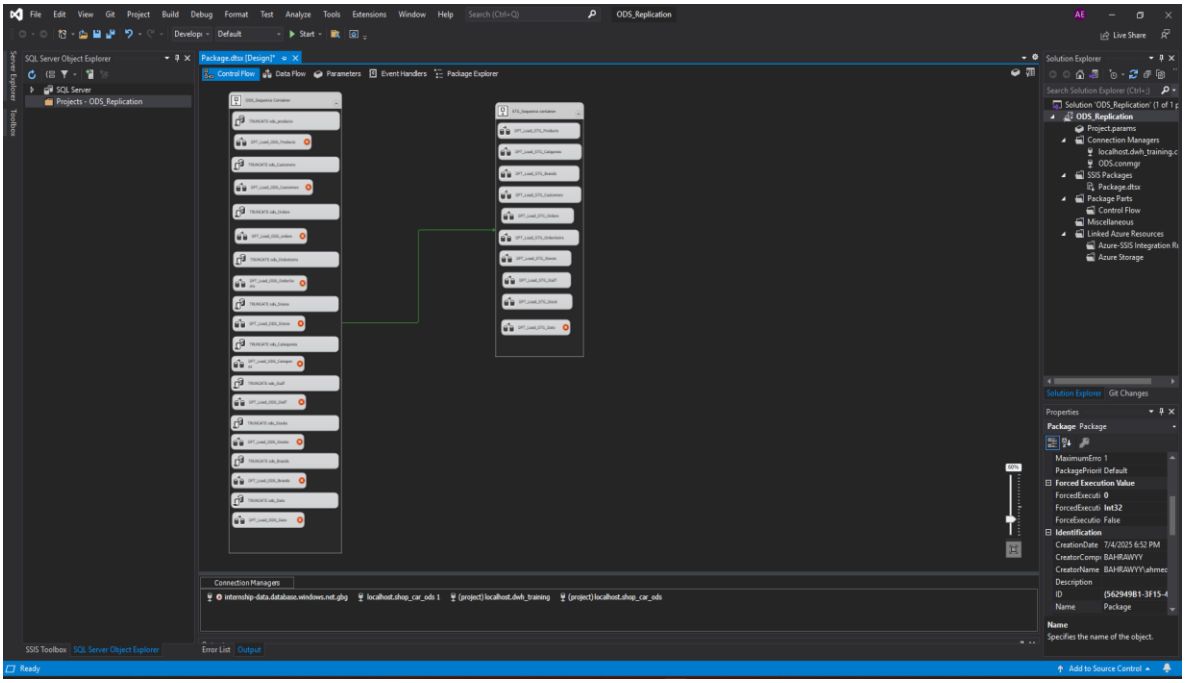
Model Deliverable: Conceptual diagram submitted as high-resolution PDF with clearly marked keys and relationships



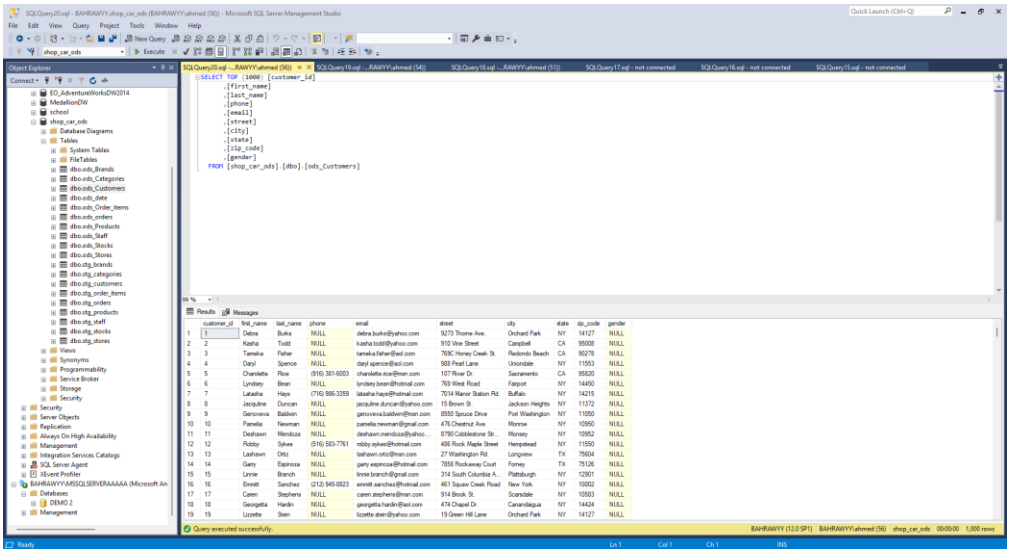
Medallion Architecture Implementation

1. ODS Layer:

Raw extraction from 10 Azure SQL tables.



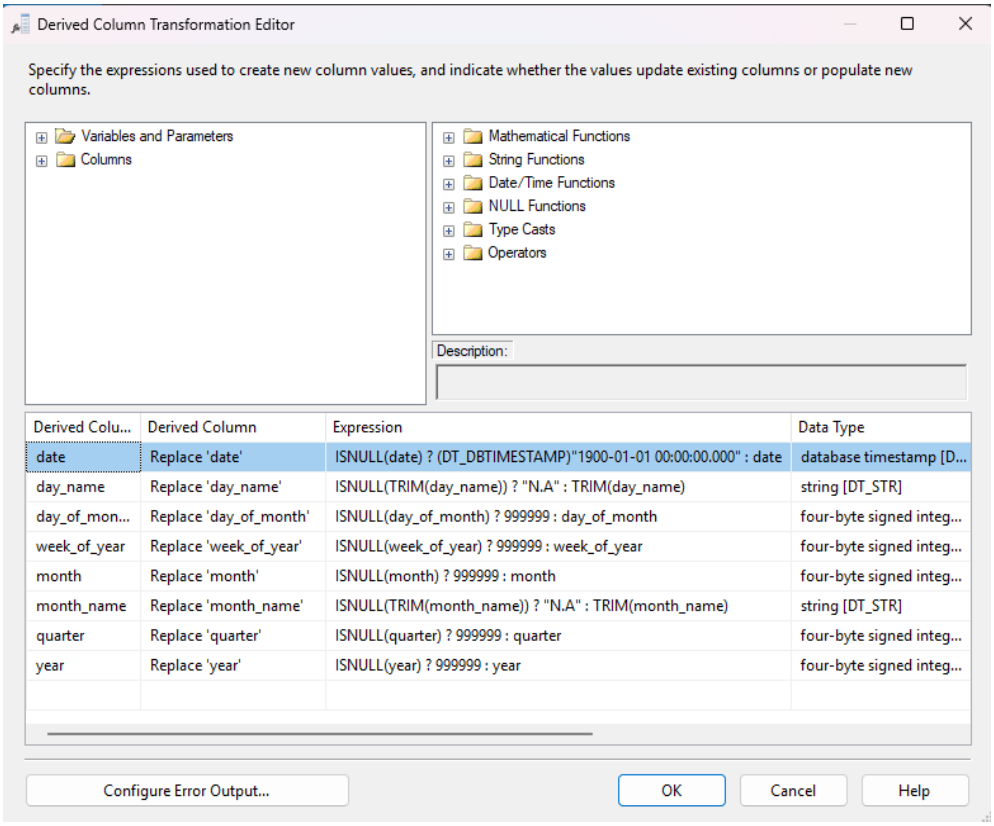
- No transformation applied at this stage.



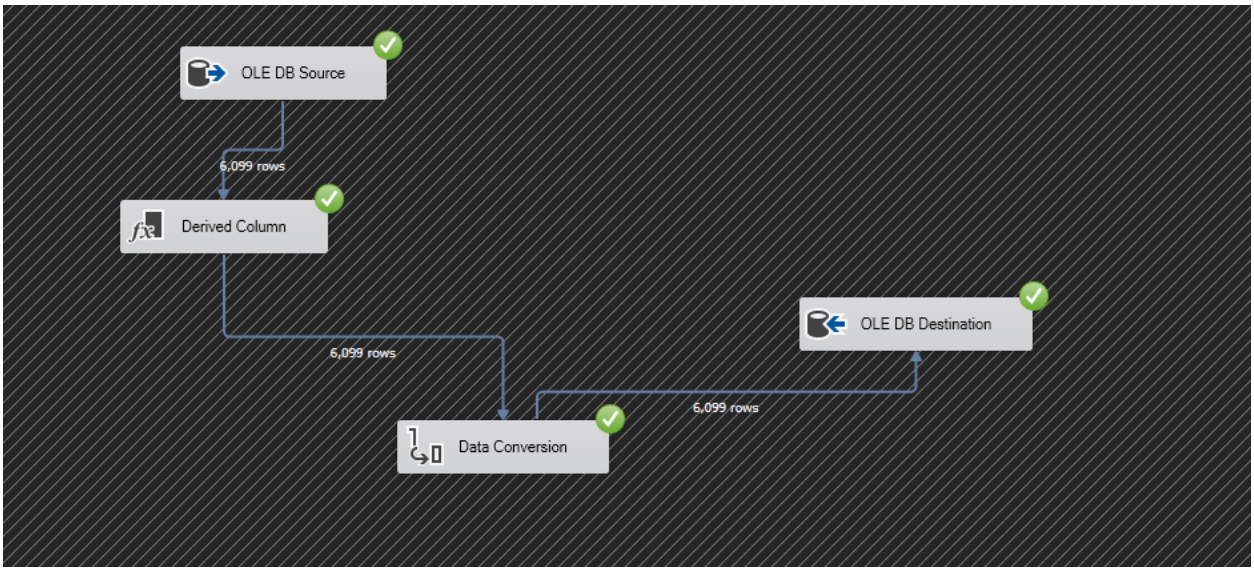
2. STG Layer:

Applied transformation logic:

(Trimmed string fields. Converted NULLs (String: "N. A", Int: 999999, Float: 999.999, Date: 1900).

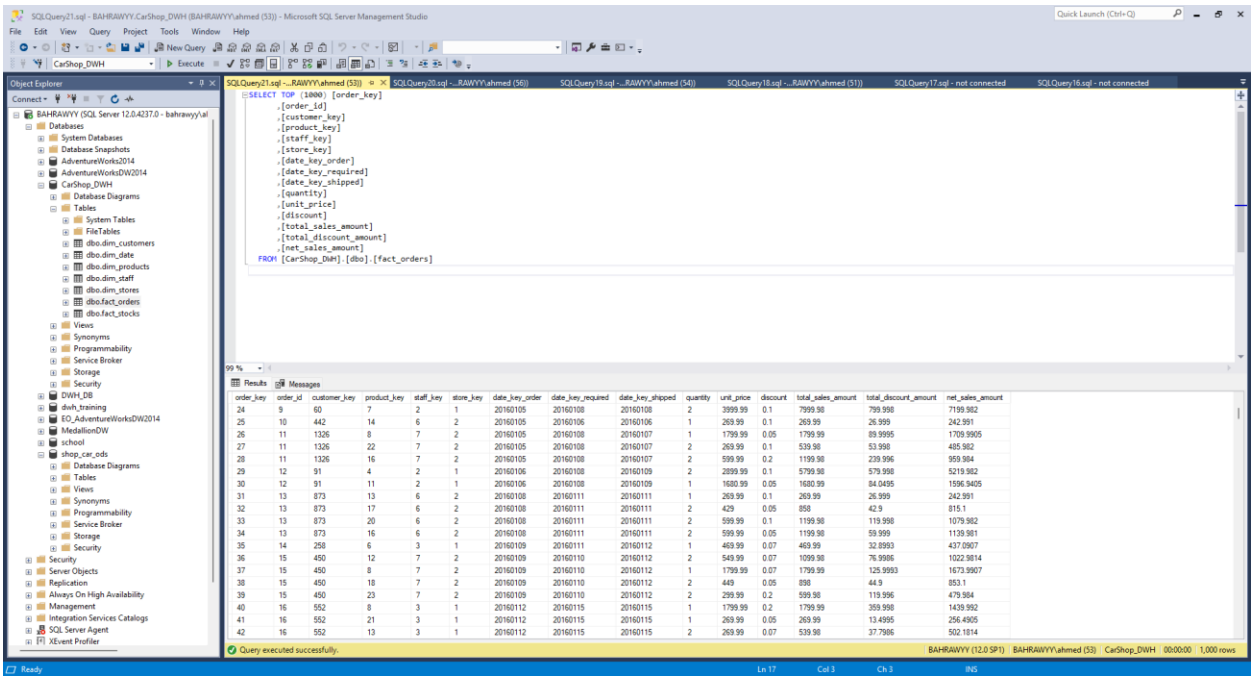


(Standardized column names and types.)



DWH Layer:

- Cleaned, validated data model.
- Used surrogate keys for relationships.
- Removed all duplicates and enforced PK/constraints.



✅ ETL Process (SSIS)

- Developed modular SSIS packages for ODS → STG and STG → DWH.
- Implemented **incremental loading** for order and customer data.
- Applied **dimension validation** to ensure referential integrity.
- Used logging and configuration files for scalable execution.
- Deployed as a single SSIS job in SSMS for manageability.

✅ DWH Backup File

- Created a .bak backup file of the final DWH instance using SSMS.
- Includes all transformed tables, constraints, and data integrity rules.
- Verified file restoration on a secondary environment to ensure validity.

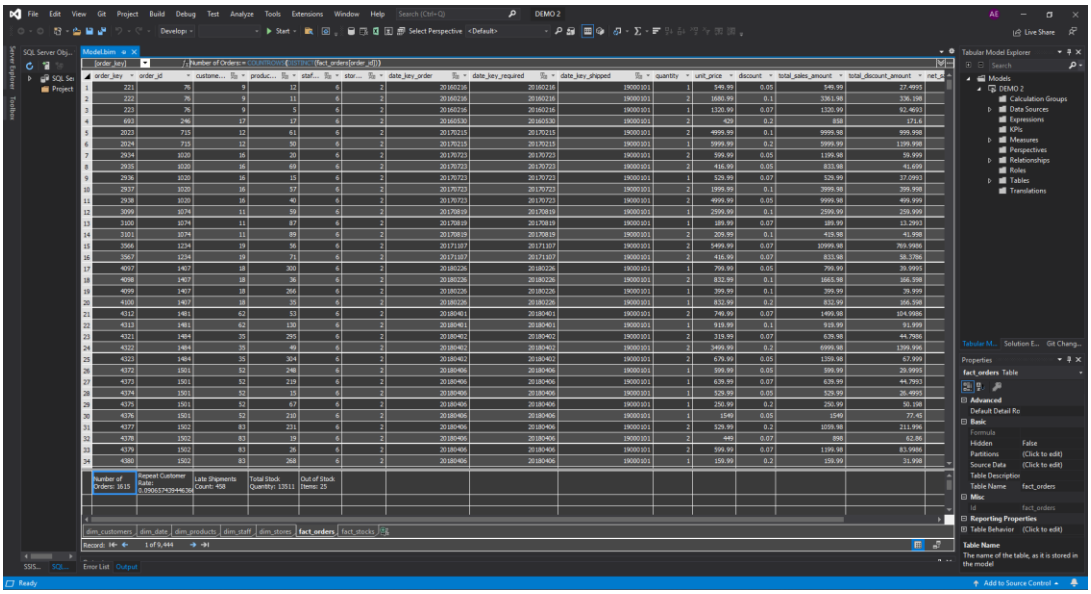
Filename: DWH_Bicycle.bak

bicycle.bak

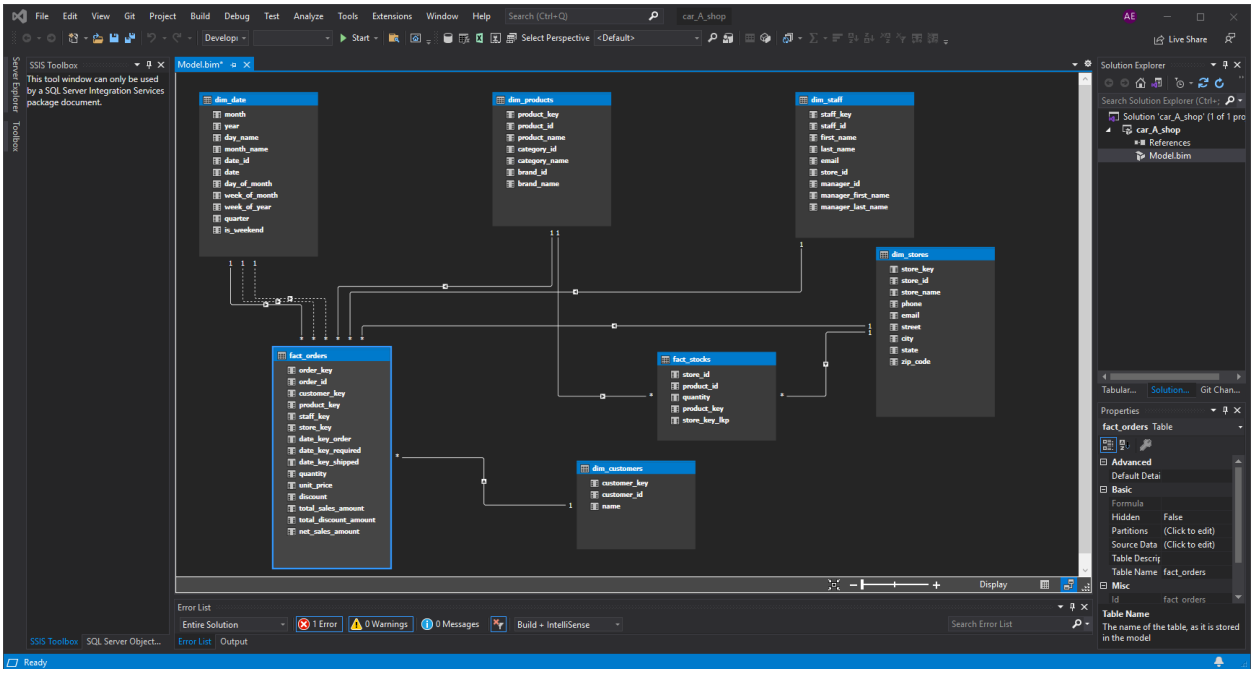
SSAS Model

Measures Developed:

- Number of Orders



- Developed an SSAS tabular model using cleaned DWH tables.



- calculated columns:
- Total Sales Amount = Unit Price * Quantity
- Total Discount = Discount Rate * Unit Price * Quantity
- Net Sales = Total Sales – Discounts
- Manager Name = CONCAT(First Name, Last Name)

Measures Developed:

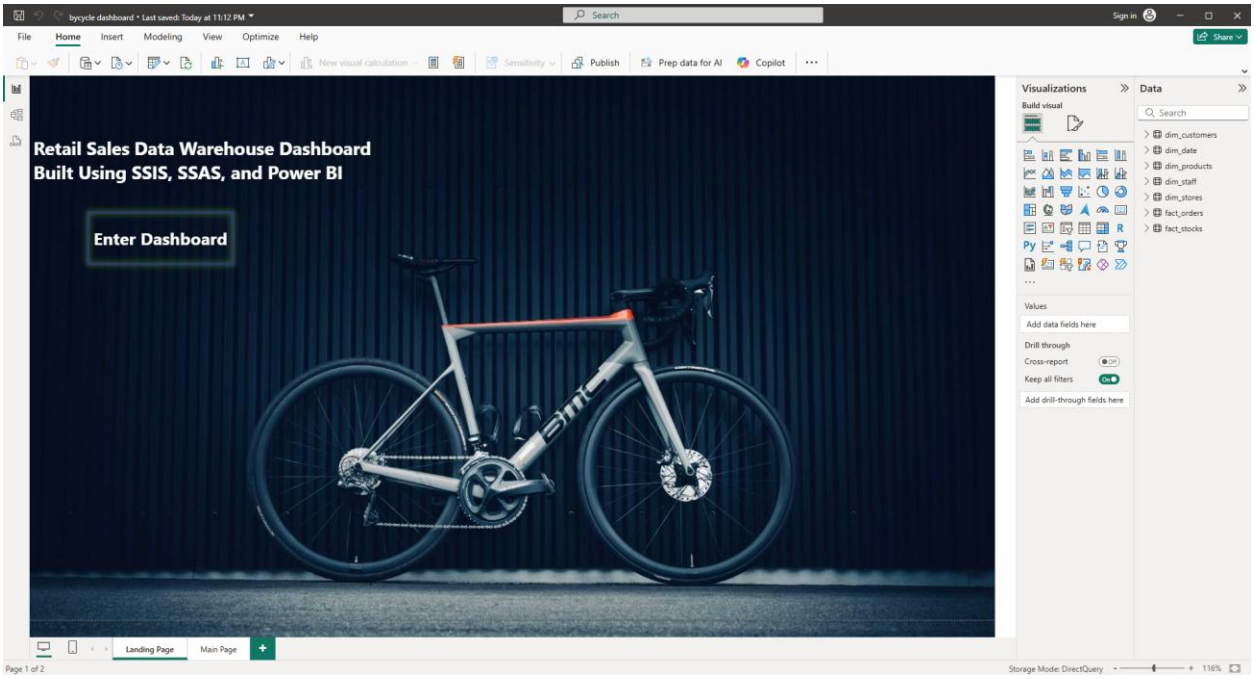
- Number of Orders
- Repeat Customer Rate
- Late Shipments Count
- Total Stock Quantity
- Out of Stock Items

Power BI Report

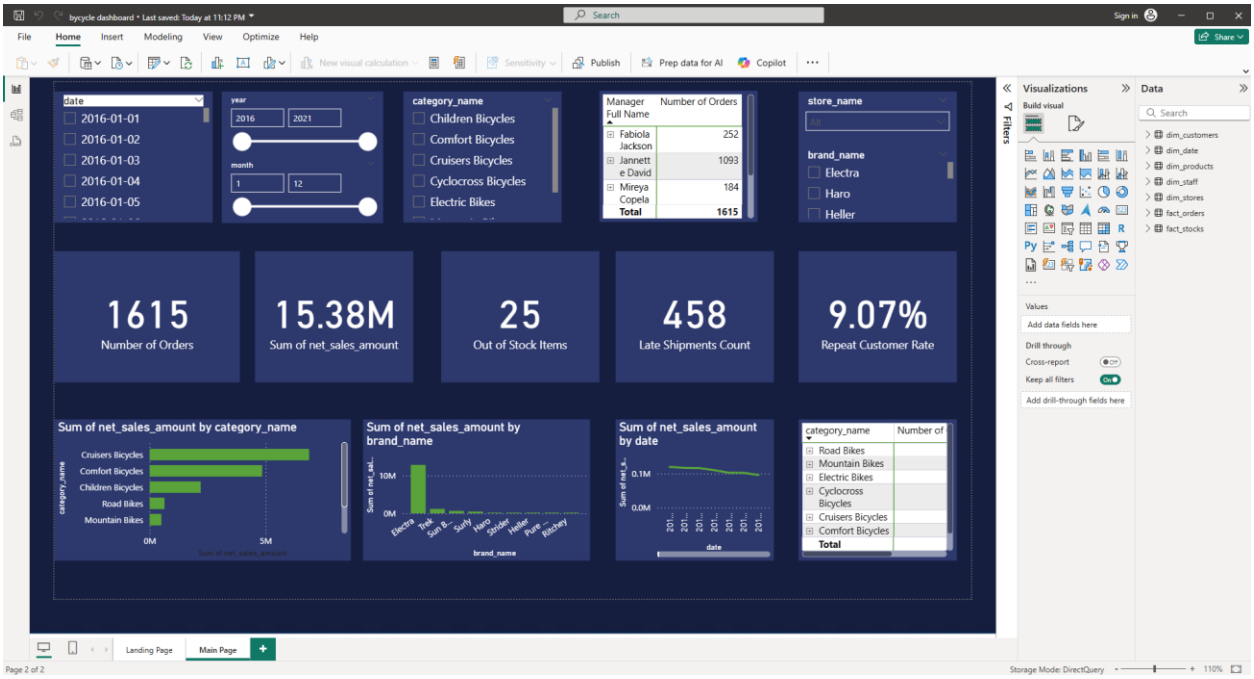
A professional Power BI report was created with two main pages:

Landing Page

- Includes navigation buttons and a project overview.



Main Page



- **Cards:**
    - Total Orders
    - Net Sales
    - Late Shipments
    - Out of Stock Items
    - Repeat Customer Rate
- **Visualizations:**
    - Sales Breakdown by Category, Brand, and Store
    - Revenue Trend by Day, Month, Quarter, Year
    - Orders by Staff & Manager

Connected directly to the SSAS model to ensure real-time, model-driven reporting.

Conclusion / Skills Gained

This project provided full-cycle experience in building a modern data warehouse using the Microsoft BI stack. Key skills gained include:

- Designing a star schema with order_items and stocks as fact tables.
- Integrating data from Azure SQL and optimizing staging for transformation.
- Developing robust SSIS ETL pipelines with error handling and incremental loading.
- Building SSAS tabular models with DAX measures for business KPIs.
- Delivering interactive Power BI reports by integrating well-modeled data from SSAS.