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# Centralised Analytics & Reporting: ****ETL → SQL → BI****(Integrating MySQL, Python-Jupyter, and Power BI)

# Business Case: GlobalMart Sales Intelligence System

GlobalMart, a multinational retail company with operations across the United Kingdom, Germany, and the United States, had long relied on **manual data tracking methods** to monitor store performance, customer behaviours, and product sales. With sales data fragmented across **CSV files**, **cloud storage**, and multiple source formats, the company lacked a single version of truth for data-driven decision-making.

As the organisation expanded, leadership recognised the urgent need for a **centralised, interactive, and automated business intelligence (BI) solution** to:

* Integrate dispersed datasets into one relational structure
* Enable real-time tracking of key sales metrics (revenue, quantity, profit)
* Empower decision-makers with intuitive dashboards and dynamic visualisations
* Democratise access to data using SQL and Python-powered insights

## Aim

To gain full-stack exposure across **ETL → SQL → BI**, making it highly applicable for roles in business intelligence, data analytics, and data engineering.

## Objective

To design and implement a **robust end-to-end BI solution** using **MySQL** for central data storage, **Python (via Jupyter Notebook)** for data ingestion and automation, and **Power BI** for executive dashboards and interactive reporting.

## Technical Architecture & Workflow

### 1. ****Data Extraction & Transformation****

* Extracted raw datasets from multiple formats (.xlsx, .csv) using Python and pandas
* Performed advanced data cleaning, formatting, and validation in **Jupyter Notebook**, ensuring consistent data types and relational integrity
* All data pipelines are automated and reproducible through Python scripts

### 2. ****Database Design & Centralisation****

* Created a **relational MySQL database** with dimension and fact tables:
  + - Customers, Products, Stores, Dates as dimension tables
    - Orders as the fact table
* Enforced foreign key relationships to maintain referential integrity
* Inserted cleaned and structured data into MySQL using Python's mysql-connector module

### 3. ****Data Modelling & Visualisation (Power BI)****

* Connected Power BI directly to MySQL for live querying
* Developed a **star-schema model** to support efficient slicing and filtering
* Created 4 interactive dashboard pages:
  + - * Executive Summary
      * Customer Detail Page
      * Product Analytics Page
      * Geospatial Stores Map

## Features Delivered

* **Live, filterable dashboard** hosted on Power BI Service
* Dynamic **KPI tracking** (Total Sales, Profit, Orders, YoY Growth, etc.)
* Drill-down capability by region, product, store type, or customer cohort
* Interactive visuals including maps, bar charts, gauges, tables and slicers
* A DatabaseConnector Python class for executing custom SQL queries outside Power BI
* Automated view generation in SQL (e.g. revenue breakdown by store type)

## Business Impact

| **Benefit** | **Description** |
| --- | --- |
| Reduced Reporting Time | Replaced 100+ hours of manual Excel reporting with real-time dashboards |
| Increased Insight Accuracy | Centralised, validated data with relational integrity ensures confidence in decisions |
| Scalable Architecture | Solution is extensible to accommodate new KPIs, regions, or departments |
| Self-Service Access | Teams can now access dashboards and run SQL queries independently |
| Skill Transfer | Trainees learn real-world integration of Python, SQL, and Power BI in a project context |

## Relevance for Data Analysis Training

This project provides an **end-to-end real-world capstone** for learners in data analytics, covering:

* + - * **Data Engineering**: Cleaning, validating, and loading structured data into a SQL database
      * **Database Design**: Constructing a production-grade relational schema in MySQL
      * **ETL Automation**: Using Python in Jupyter to streamline ingestion and error handling
      * **BI & Storytelling**: Designing dashboards that speak to business performance and strategy