

System Analysis & Design

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i. Problem Statement & Objectives

• Problem Statement:

- The organization lacks a structured process for managing and analyzing data from AdventureWorks. This results in difficulties generating insights for decision-making, coordinating project activities, ensuring data quality, and tracking progress. A comprehensive project management plan and analytical framework are needed to guide execution, reduce risks, and evaluate performance using KPIs.

• Project Objectives:

- **Objective 1:** Establish a structured project management plan that defines the scope, timeline, resources, and deliverables for the AdventureWorks data analysis project.
- **Objective 2:** Collect, clean, and integrate data from multiple AdventureWorks domains (sales, customers, products, and territories) to ensure a reliable analytical foundation as shown in the following pic(1).
- **Objective 3:** Develop interactive dashboards and visualizations that provide executives with actionable insights and support strategic decision-making.
- **Objective 4:** Identify business trends related to revenue growth, customer behavior, product performance, and regional sales patterns.
- **Objective 5:** Implement KPIs that measure sales effectiveness, customer retention, operational efficiency, and project performance.
- **Objective 6:** Create risk assessment and mitigation strategies to address potential issues such as data inconsistency, tool limitations, and coordination challenges.



ProductID	ProductName	ProductNumber	Color	StandardCost	ListPrice	ReorderPoint	OrderQuantity	DaysOnOrder	DaysToDelivery	ActualCost	ModifiedDate
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10001	Adventure WorksLT	AWLT0002	Yellow	100.00	200.00	100	10	10	3	100.00	2007-01-01
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ii. Use Case Diagram & Descriptions

-To make sure that tasks were distributed fairly and efficiently, the project team used a Project-Based Strategy. There were six members, and each of them was given one of three important roles. The Data Engineers oversaw gathering, cleaning, and getting the data ready. The Data Analysts did exploration data analysis (EDA) and came up with important ideas. The BI Developers worked on making Power BI dashboards and setting key performance indicators (KPIs). This structured distribution encourages teamwork, consistency, and quality throughout all project phases, making sure that deliverables are finished on time and to a high standard.

-Oversees project execution and ensures milestone completion: [Yara Said](#).

- Ensure the project plan is followed.
- Monitors milestone completion.
- Coordinates communication between all teams.
- Ensures timely delivery of tasks.

-Data Engineer: Mahmoud Shaker - Amina El-Shabndy.

- Collect raw data from various sources.
- Clean, transform, and preprocess datasets.
- Handle missing values, format inconsistencies, and data quality issues.
- Deliver fully prepared datasets to Data Analysts.

-Responsible for data collection, cleaning, and preparation Data Analyst Performs EDA: [Nour Gad -Abdelhady Hussein](#).

- Analyze prepared data for patterns and trends.
- Conduct statistical and visual analyses.
- Identify meaningful insights and performance issues.
- Collaborate with BI developers by providing insights needed for dashboard creation.

-Generates insights. & BI Developer & Designs Power BI dashboards and KPIs: [Kholud Mostafa – Amina El--Shabndy](#).

- Design Power BI dashboards.
- Define and visualize key performance indicators (KPIs).
- Integrate insights from Data Analysts.
- Present final dashboards for decision-making.

-Documentation Specialist & Prepares project documentation and reporting: [Abdelhady Hussein](#).

- Develop detailed project reports.
- Document system workflow, methods, diagrams, and results.
- Organize all deliverables including visualizations and interpretations.
- Ensure documentation consistency and academic quality.

iii. Functional & Non-Functional Requirements

• Functional Requirements (FR)

These describe what the system **must do** to meet project objectives.

FR1 – Data Collection, Cleaning & Preparation

The system must be able to collect raw data from the AdventureWorks dataset, clean it, handle missing values, remove inconsistencies, and prepare a fully structured dataset for analysis.

FR2 – Data Modeling & Relationship Building

The system must design and implement a relational data model that connects fact and dimension tables through appropriate keys (e.g., ProductKey, CustomerKey, TerritoryKey).

FR3 – Exploratory Data Analysis (EDA)

The system must allow analysts to perform statistical and visual exploration to identify trends, patterns, anomalies, and insights across sales, customer behavior, products, and territories.

FR4 – KPI Definition & Calculation

The system must compute KPIs such as total sales revenue, average order value, customer retention rate, territory revenue growth, and product profit margins.

FR5 – Dashboard Development in Power BI

The system must provide interactive dashboards presenting sales performance, product analytics, customer insights, and regional performance with drill-down and filtering capabilities.

FR6 – Reporting & Documentation

The system must generate a complete project report summarizing objectives, methods, findings, KPI outputs, risk assessment, and final conclusions.

• Non-Functional Requirements (NFR)

These describe **how** the system should operate.

NFR1 – Performance & Efficiency

Data processing, modeling, and dashboard loading must be optimized for speed and efficiency, including reducing dataset size, removing unused columns, and using efficient relationships to ensure smooth Power BI performance.

NFR2 – Data Accuracy & Integrity

All datasets must maintain consistency and correctness.

This includes accurate data cleaning, verified relationships, validated KPI formulas, and double-checked calculations to prevent incorrect insights.

NFR3 – Usability & User Experience

The dashboards must be visually clear, easy to navigate, and provide meaningful insights with minimal user effort. KPIs must be displayed in an intuitive and decision-friendly manner.

NFR4 – Reliability & Availability

The system must remain stable throughout all project phases—data preprocessing, modeling, analysis, visualization, and reporting—ensuring that results can be reproduced at any time.

NFR5 – Maintainability

Documentation must clearly describe all processes, transformations, and modeling decisions so team members and stakeholders can easily maintain or extend the solution in future enhancements.

Database Design & Data Modeling

The ER diagram represents the core relationship between the AdventureWorks fact and dimension tables. The central structure follows a **star-schema** design, ensuring efficient analytics and optimized dashboard performance.

Main Entities:

- **FactInternetSales** (Fact table)
- **DimProduct**
- **DimProductSubcategory**
- **DimProductCategory**
- **DimCustomer**
- **DimGeography / DimTerritory**
- **DimDate**

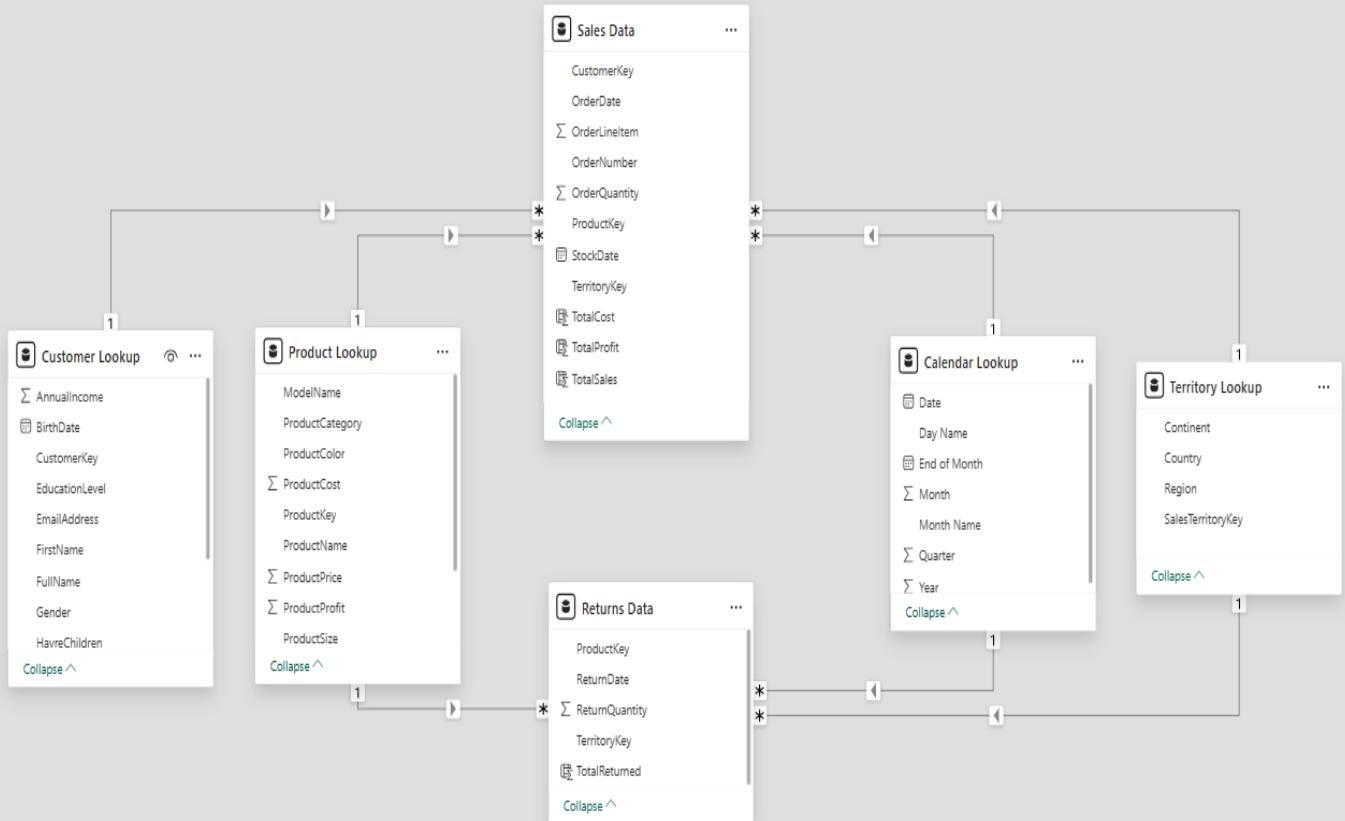
Key Relationships:

- FactInternetSales[ProductKey] → DimProduct[ProductKey]
- DimProduct[ProductSubcategoryKey] → DimProductSubcategory[ProductSubcategoryKey]
- DimProductSubcategory[ProductCategoryKey] → DimProductCategory[ProductCategoryKey]
- FactInternetSales[CustomerKey] → DimCustomer[CustomerKey]
- DimCustomer[GeographyKey] → DimGeography[GeographyKey]
- FactInternetSales[OrderDateKey] → DimDate[DateKey]

Final Summary :

- **Data Modeling View:** Full star schema with connected fact and dimension tables.
- **Product Category Before:** Cleaned starting table.
- **Product Subcategory Before:** Another cleaned table.
- **Merged Category & Subcategory:** Combined using Power Query merge operations.
- **Product Table After Merging:** Final dimension containing complete product information

As shown in the Following Data Model :



UI/UX Design & Prototyping

The Power BI dashboard mockup below represents the final UI design for visualizing key business insights from the AdventureWorks dataset. It showcases a clean, minimalist interface focusing on clarity, accessibility, and decision-making efficiency.

1. Color Scheme

The dashboard uses a **modern, clean, and professional color palette** aligned with BI visualization standards:

- **Primary Color:** Teal (#45D3D3) – used for KPI highlight values and chart bars
- **Neutral Background:** Light gray & white – ensures readability and focus on visuals
- **Contrast Colors:** Dark gray & black for labels, titles, and axes
- **Accent Colors:** Multi-color palette for pie chart categories

This color scheme supports visual hierarchy, easy interpretation of trends, and a consistent aesthetic across all visuals.

2. Typography

Typography was selected for readability and professional appearance:

- **Main Titles:** Bold Sans-Serif (e.g., Segoe UI Bold)
- **KPI Numbers:** Large, high-contrast Sans-Serif for quick scanning
- **Labels & Axis Text:** Regular Sans-Serif for clarity at smaller sizes
- **Navigation & Filters:** Neutral tones to avoid drawing unnecessary attention

This ensures the dashboard remains clean, legible, and suitable for presentation environments.

3. Accessibility

The dashboard design considers key accessibility principles:

- **High contrast** between text and background for readability
- **Color-blind friendly palette**, avoiding excessive red/green combinations
- **Consistent labeling**, including numeric values on charts for clear interpretation
- **Large clickable areas** for filters and visuals
- **Tooltips** included for additional context
- Avoids unnecessary clutter to support users with cognitive load challenges

These guidelines ensure the dashboard is usable by a wide range of stakeholders regardless of visual or technical limitations. As shown in the Following images :

