🔹 Week 5: Data Modeling, Relationships & Basic Visualizations [Power BI]

🔸 Objective

The objective of Week 5 was to build a **strong data model** before creating visuals by understanding **data types, keys, relationships, star schema, and cardinalities**, and then choosing **appropriate basic visualizations** based on the type of data and the business question. This week focused on **model-first reporting** to ensure accurate filtering, aggregation, and performance in Power BI.

🔸 Tools & Technologies Used

- Power BI Desktop
- Power Query (cleaned data from previous weeks)
- Model View (Relationships)
- FEMA & Netflix datasets

🔸 Why Data Modeling Before Visuals

Creating visuals without a proper data model can lead to:

- Incorrect totals
- Wrong filtering behavior
- Double counting
- Poor performance

A clean data model ensures:

- Correct aggregations
- Proper cross-filtering
- Reusable measures
- Scalable reports

Guiding question used before creating visuals:

“Is my data model correct so that this visual shows accurate results?”

🔸 Data Types (For Visualization Readiness)

- **Categorical:** used for grouping and comparison
- **Numerical:** used for calculations and measures
- **Date & Time:** used for trends and time analysis

Understanding data types helps select the **right visual** and build the **right relationships**.

🔸 **Data Modeling Basics**

🔹 **Primary Key (PK)**

- Uniquely identifies each record in a table
- Should have unique values and no blanks

🔹 **Foreign Key (FK)**

- Refers to the Primary Key of another table
- Used to establish relationships between tables

Principle: PK should be on the **dimension table**; FK should be in the **fact table**.

🔸 **How Relationships Are Established in Power BI**

🔹 **Step-by-Step (Conceptual)**

1. Identify the **Fact table** (transactions/measures).
2. Identify **Dimension tables** (descriptive attributes).
3. Choose the **Primary Key** in each dimension table.
4. Match it with the corresponding **Foreign Key** in the fact table.
5. Create relationships in **Model View**.
6. Set correct **cardinality** and **cross-filter direction**.
7. Validate results with a simple visual to ensure filtering works.

🔸 **Star Schema (Recommended Model)**

- One **Fact table** connected to multiple **Dimension tables**
- Dimensions connect **only to the Fact table**, not to each other

Benefits:

- Better performance
- Simpler DAX
- Predictable filtering
- Cleaner report design

🔸 **Cardinalities (Relationships)**

- **One-to-Many:** Recommended and most common
- **Many-to-One:** From fact to dimension
- **One-to-One:** Rare
- **Many-to-Many:** Avoid where possible (use bridge tables if required)

Correct cardinality ensures:

- No double counting
- Correct totals
- Proper slicer behavior

🔸 **Basic Visualizations [After Model Is Ready]**

- **Bar/Column:** Compare categories
- **Line:** Trend over time
- **Pie:** Part-to-whole (with limits)
- **Tables:** Detailed values for validation

Design rules followed:

- Do not exceed **5–6 categories** per visual
- Pie charts represent **100% total**
- Each visual answers a **clear question**

🔸 **Key Points (Week 5)**

- Built a **model-first** approach before visuals
- Identified PK and FK correctly
- Established relationships in Model View
- Applied **Star Schema** for clarity and performance
- Set correct **cardinalities**
- Verified relationships using simple visuals
- Chose basic visuals based on data types and questions