* 1. **Dimensional Modelling**

**Dimensional Modeling** is a data modeling technique specifically designed for data warehousing and business intelligence (BI) applications. It is optimized for **query performance**, **data retrieval**, and **reporting** rather than transactional operations.

It organizes data into **facts** and **dimensions**:

* **Fact Tables**: Contain **quantitative data** (measurable facts), such as sales revenue, number of items sold, or hours worked. Facts are usually **numeric** and **additive**.
* **Dimension Tables**: Contain **descriptive attributes** (context for the facts), such as date, product, region, or customer.

In dimensional models, especially when used for analytical purposes:

A **relationship between a fact and a dimension can be referred to as a navigation path, because it defines how users can "navigate" from measures (facts) to descriptive data (dimensions)**.

**Why It's Called a Navigation Path:**

* Users navigate through dimensions (e.g., Date, Product, Region) to drill down, roll up, or slice-and-dice measures like sales or revenue.
* Tools like Power BI, Tableau, Cognos, or SAP BW rely on these paths to understand how data is related for reporting purposes.

**Core Concepts of Dimensional Modeling**

1. **Star Schema**:
   * A central **fact table** connected to multiple **dimension tables**.
   * Simple and optimized for performance.
   * Example:
     + Fact Table: Sales (sales amount, quantity)
     + Dimension Tables: Customer, Product, Date, Store
2. **Snowflake Schema**:
   * A variation of the star schema where **dimension tables are normalized** into sub-dimensions.
   * More complex, but can save storage and improve maintainability.
3. **Fact Types**:
   * **Transactional Fact**: Captures detailed event-level data (e.g., each sale).
   * **Snapshot Fact**: Captures data at regular intervals (e.g., daily inventory levels).
   * **Accumulating Snapshot Fact**: Tracks progress over a lifecycle (e.g., order processing stages).

**Applications That Require Dimensional Modeling**

Dimensional modeling is ideal for systems where **data is used for analysis, reporting, and decision-making**, such as:

**1. Data Warehousing**

* Centralized storage for integrated historical data from multiple sources.
* Example: An enterprise data warehouse storing 5 years of sales, customer, and inventory data.

**2. Business Intelligence (BI) and Reporting Tools**

* Enables dashboards, KPIs, visual analytics, and slice-and-dice functionality.
* Example: Power BI, Tableau, SAP BusinessObjects using dimensional models to show sales trends by region or product.

**3. Online Analytical Processing (OLAP)**

* OLAP cubes are built on dimensional data models for fast querying and aggregation.
* Example: A financial cube analyzing revenue across regions, quarters, and product lines.

**4. ETL Processes**

* Simplifies Extract-Transform-Load pipelines by structuring data for analysis after transformation.
* Example: ETL tools populating star schemas nightly from multiple transactional systems.

**5. Executive Dashboards and Management Reports**

* Executives need fast, summarized views of business performance metrics.
* Example: A CEO dashboard showing monthly profit by business unit.

**6. Customer Analytics and Marketing**

* Understanding customer behavior through segmentation, trends, and campaigns.
* Example: A retailer tracking customer purchase frequency and preferences.