**CUBE**

**Multidimensional Data Model and Conceptual Modeling**

**The Cube**

* **Definition**: Basis of multidimensional analysis.
* It represents **data across multiple dimensions**,
* **Components**:
  + **Edges**: ------------🡪Represent dimensions.
  + **Cells**: -------------🡪one or more metrics based on dimensions.
  + **Dimensionality**: Number of dimensions in the cube.
* **Visualization**:
  + 2 Dimensions: Table
  + 3 Dimensions: Dice
  + 3 Dimensions: Multidimensional domain structure
* **Schema (C) of a Cube**:
  + Dimensions Schema (DS)
  + Metrics (M)

Representation: C=(DS,M)=({D1,...,Dn},{M1,...,Mm})

**Orthogonality**

* **Definition**: No functional dependencies between attributes of different dimensions.
* Ensures independence between dimensions
* Each **dimension** in a data warehouse is **independent** of the others.
* There are **no relationships or dependencies** between attributes from different dimensions.
* This guarantees that changes in one dimension **do not** affect another, maintaining **data integrity and consistency**.

**Conceptual Modelling**

**Conceptual Modeling**

* **Purpose**: Formal description of problems and required information structures for a use case.
* **Issues with Conventional Design Techniques (ER, UML)**:
  + Inadequate semantics for multidimensional data models.
  + Focuses on analysis rather than universal applicability.

ME/R Model (Multidimensional Entity/Relationship Model)

* + Extension of Classical ER Model
  + **Dimension Level**: Entity set for classification levels; dimensions not explicitly modeled.
  + **Fact**: n-ary relationship set with metrics as attributes.
  + **Classification & Roll-Up**: Defines directed, non-cyclic graph for aggregating data.

ADAPT (Application Design for Analytical Processing Technologies)