Entity-Relationship Models

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Entity-Relationship Models

- Entities
- Attributes
- Relationships

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The Role of Conceptual Models

High-level but concrete view of data understandable by end users and database developers

Database Design Process

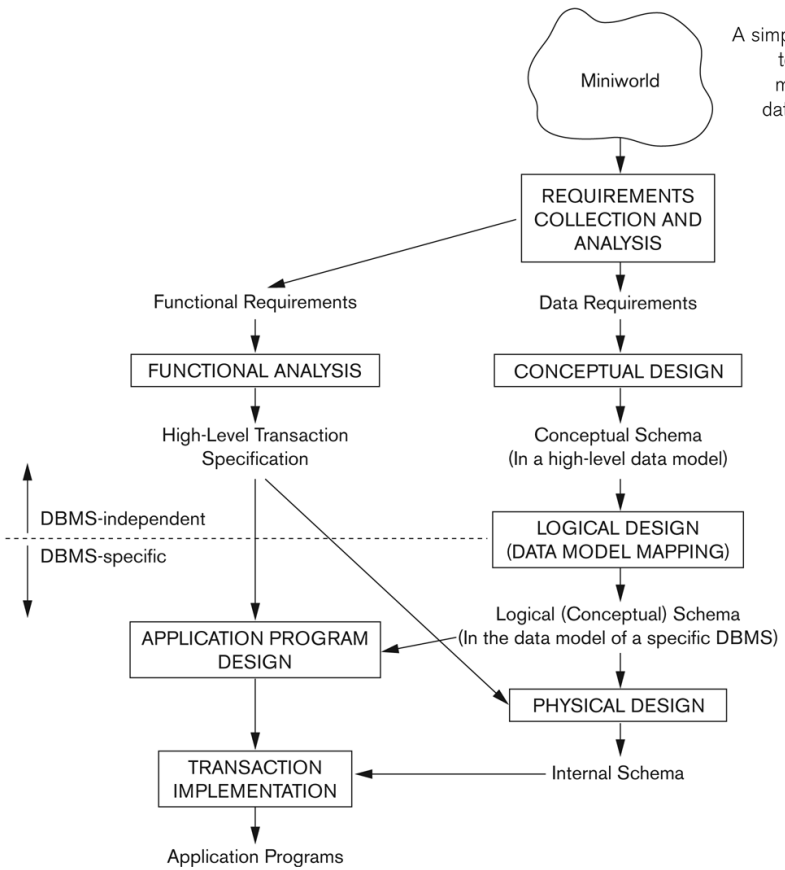

Figure 3.1
A simplified diagram to illustrate the main phases of database design.

ER modeling is the box labeled "Conceptual Design."

Entities and Entity Types

An entity is a real or abstract thing with an independent existence in the world.

- Person (real)
- Building (real)
- Job (abstract)
- Course (abstract)

In ER models we often say "entity" when we mean "entity type."
An entity type is a set of entities (instances) with the same attributes, i.e., properties of entities

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Atomic and Composite Attributes

- Atomic attributes, e.g., `Birthdate`
- Composite attributes, e.g., `Name`

Attributes (2)

- Single-valued, e.g.,
- Multi-valued, e.g.,

Attributes (3)

- Stored, e.g.,
- Derived, e.g.,

Attributes (4)

- Complex attributes
- NULL values

Entity Sets

Keys

Domains/Value Sets

First Draft of Department ER Model

Specification:

-

ER Model:

First Draft of Project ER Model

Specification:

-

ER Model:

First Draft of Employee ER Model

Specification:

-

ER Model:

First Draft of Dependent ER Model

Specification:

-

ER Model:

Relationship Types

A.K.A. Relationship sets

Relationship Instances

Relationship Degree

Relationships as Attributes

Recursive Relationships

Binary Relationship Constraints

- Cardinality ratios
- Participation constraints

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Cardinality Ratios

Participation Constraints

- Total (existence): every entity in an entity set participates in a relationship
- Partial: some of the entities in an entity set participate in a relationship

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Attributes of Relationship Types

Weak Entity Types

Weak Entity Types

- Don't have keys
- Has partial keys
- Must have total participation with identifying entity type
- Identifiable by a composite key: identifying entity's key + weak entity's partial key

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