The Database Development Process

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Computer Information Systems

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WHY???

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Information system architecture

1. *Data*
2. *Processes* that manipulate data
3. *Networks* that transport data around the organization and between the organization and its key business partners
4. *People* who perform processes and are the sources and receivers of data and information
5. *Events and points in time* when processes are performed
6. *Reasons* for events and rules that govern the processing of data

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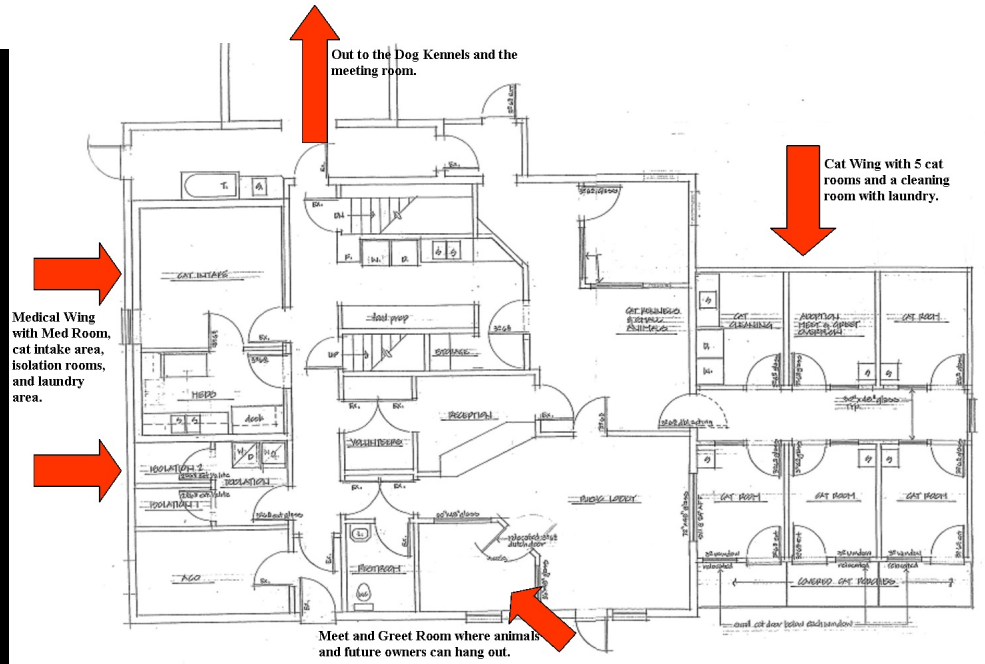
ISA



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Enterprise data modeling

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Information engineering

1. top-down approach

2. bottom-up approach

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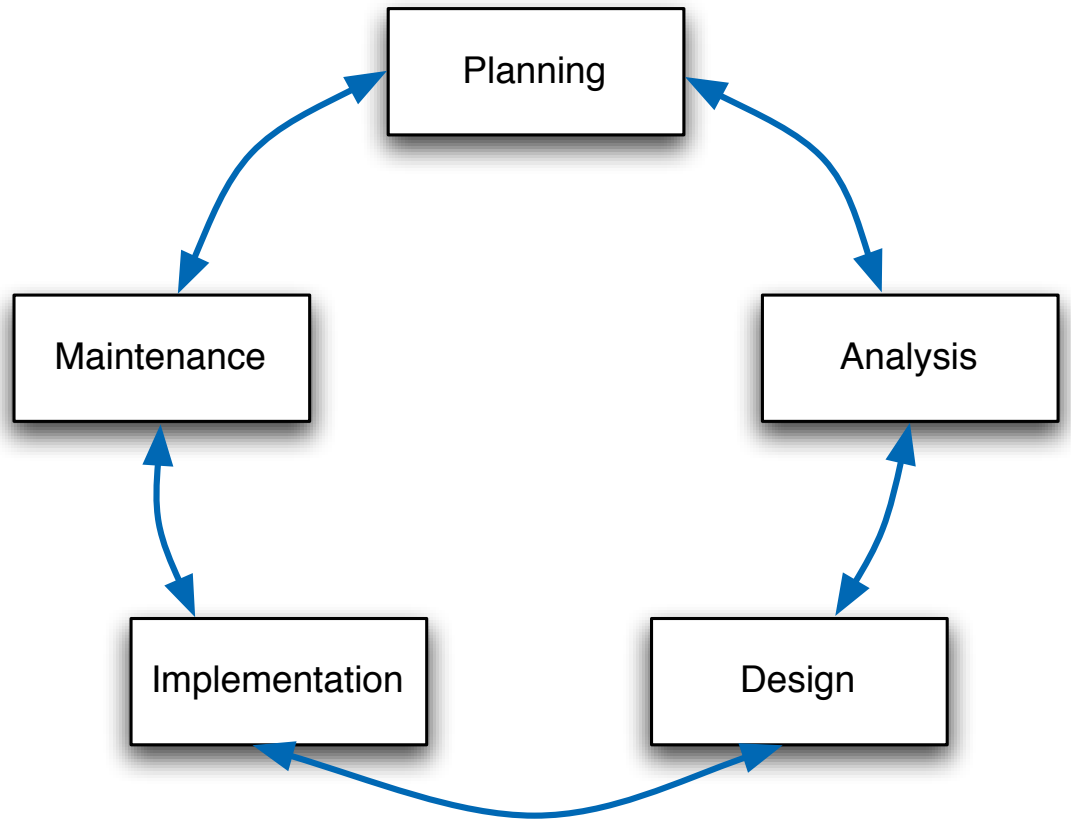
System Development Life Cycle

The SDLC is a complete set of steps that a team of information system professionals follow in an organization to specify, develop, maintain information systems.



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SDLC (cont.)

1. Planning

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   - Purpose: preliminary understanding
   - Deliverable: request for study
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   - Purpose: information requirements elicitation and structure, technology and organizational specifications
   - Deliverable: detailed design specifications
4. Implementation

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   - Purpose: programming, testing, training, installation, documenting
   - Deliverable: operational programs, documentation, training materials
5. Maintenance

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5. Maintenance
   - Purpose: monitor, repair, enhance
   - Deliverable: periodic audits

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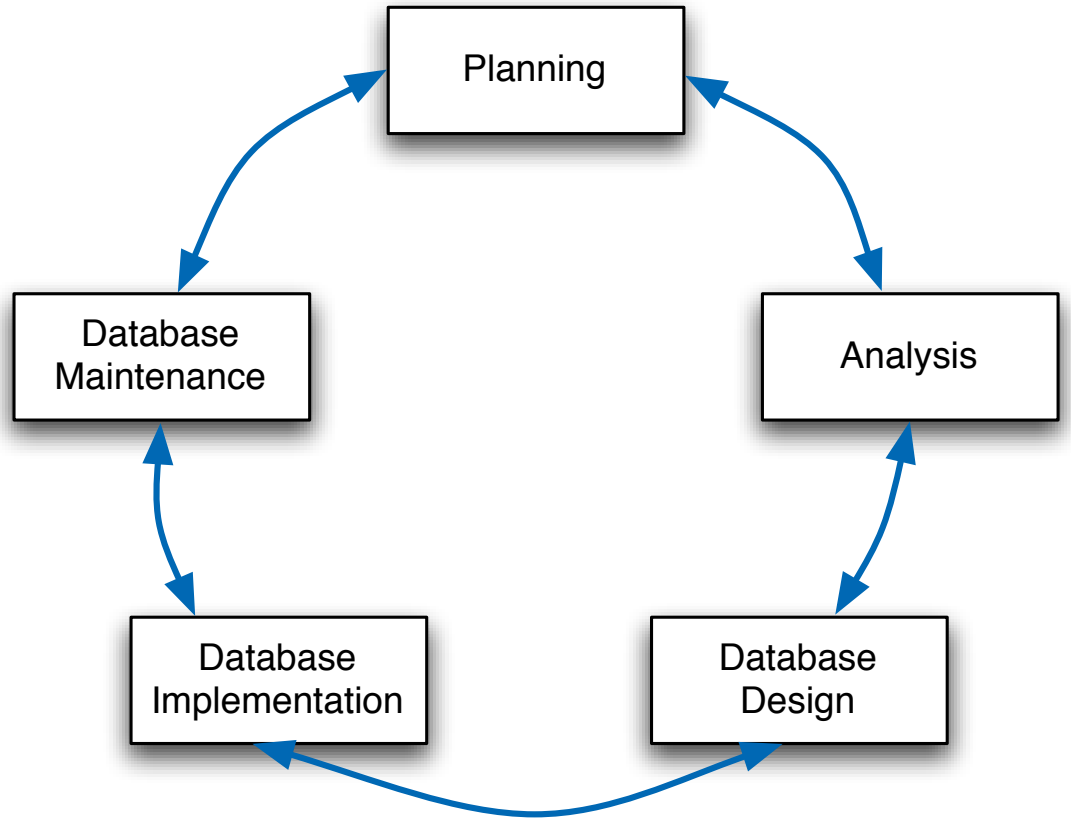
Database development process



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DB development process (cont.)

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3. Database design
   - Logical database design (transactions, forms, views, data integrity)
   - Physical database design (DBMS, physical organization of data)

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5. Database maintenance
   - performance analysis and tuning, bug fixing

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SDLC and RAD

- System Development Life Cycle (SDLC)
  - detailed, well-planned development process
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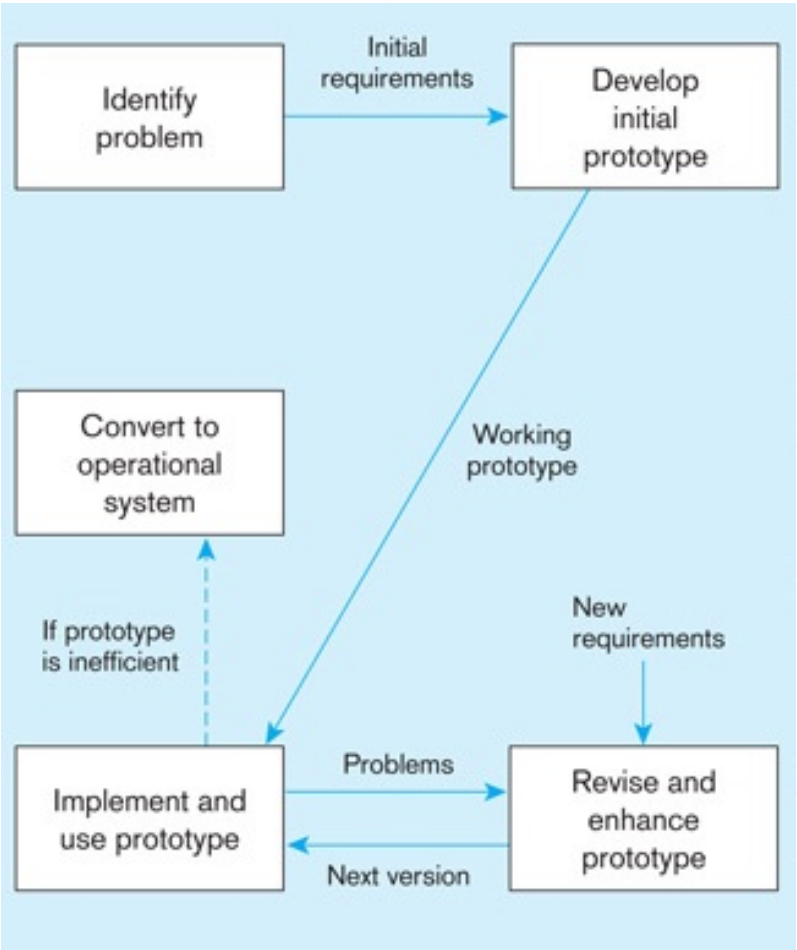
- Rapid Application Development (RAD)
  - cursory attempt at conceptual data modeling
  - define database during development of initial prototype
  - repeat implementation and maintenance activities with new prototype versions

Prototyping

Prototyping - an iterative process of system development in which requirements are converted to a working system that is continually revised through close work between analysts and users



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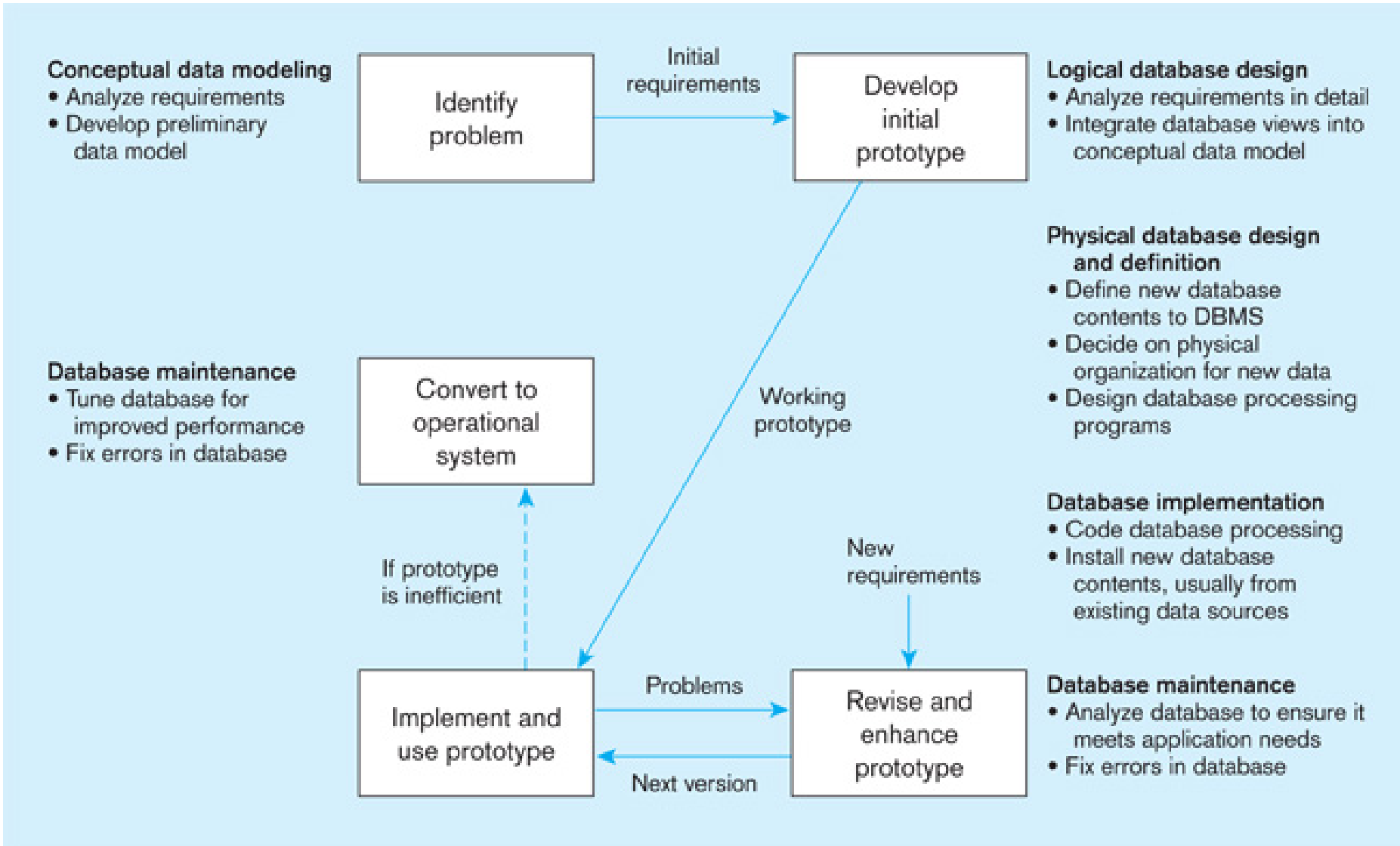

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Packaged data models

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CASE tools

Three-schema architecture

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Data models

- High-level or conceptual data models
- Representational (or logical) data models
- Low-level or physical data models

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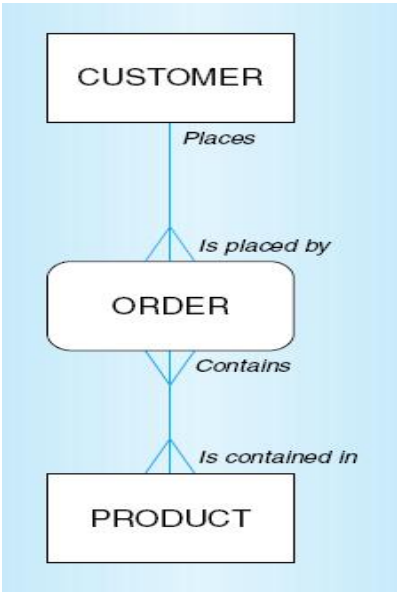
Conceptual data model

- An **entity** represents a real-world object or concept.
- An **attribute** represents some property of interest that further describes an entity.
- A **relationship** among two or more entities represents an association among entities.



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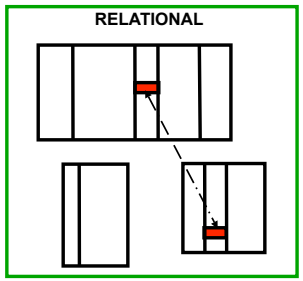
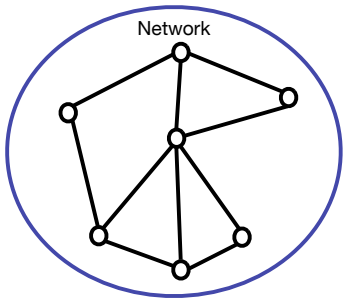
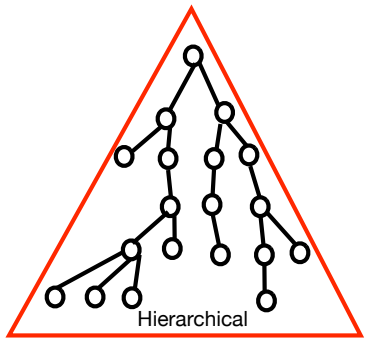
Representational data model

- **relational**
- network
- hierarchical







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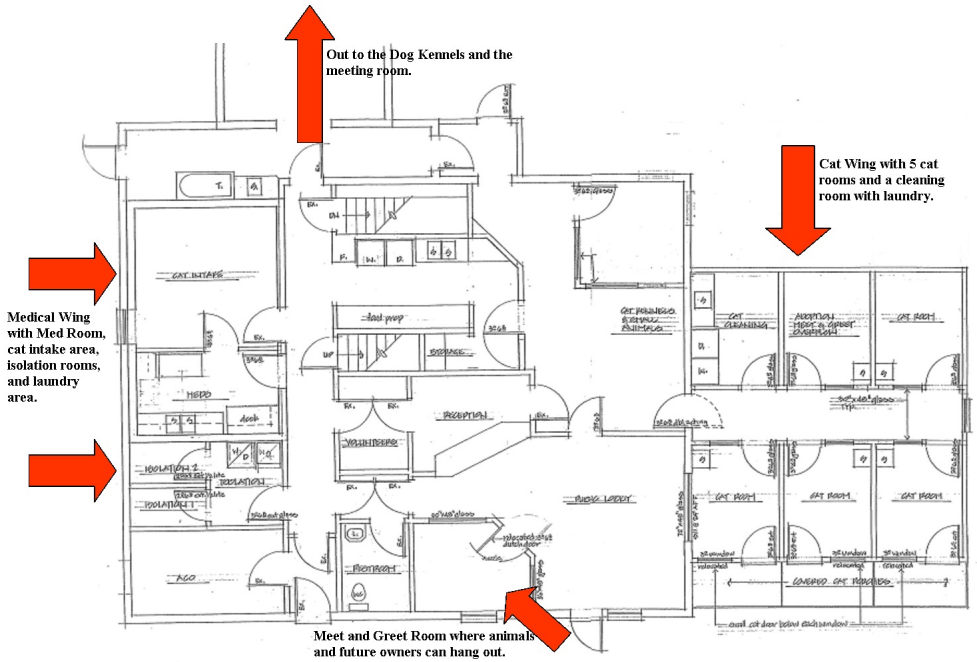
Schema

A **database schema** is the description of a database, specified during database design and not expected to change frequently.



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Three-Schema Components

1. **External schema** is the view of managers and other employees who are the database users.
   The external schema can be a combination of **the enterprise data model** (a top-down view) and a collection of detailed (bottom-up) **user views**

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3. **Internal schema** consists of two separate schemas: **logical** and **physical**.
   Logical schema is the representation of data for a type of data technology; physical schema is data representation using a particular DBMS.

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External Schema

Enterprise data model:High level model that identifies, defines, and relates the major entities of interest in an organization (abstract).

User views: Logical description of some portion of an enterprise database (detailed).

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Conceptual Schema

A conceptual schema is a detailed, technology independent specification of the overall structure of organizational data.

- Scope is the entire organization
- All entity types and subtypes are included
- All relationships are documented
- All attributes, primary and secondary keys are included
- All data types, attribute domains and business rules are specified

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Logical Schema

A logical schema is a representation of a database for a particular data management technology.

Relational data model

- tables
- columns
- rows
- primary keys, foreign keys, etc.

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Physical Schema

A physical schema is a set of specifications that describe how data from a logical schema is stored by a specific database management system.

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Three-schema DB design