Database Design Process
2-fold Process

• Model some part of the Real World (Miniworld) as DATA
• Determine the OPERATIONS to be used on this model.
• Both have DBMS independent and DBMS specific aspects.
REQUIREMENTS COLLECTION & ANALYSIS

- Discover DATA and OPERATIONS requirements
  - Interaction with the customer
- We will discuss DATA now, OPERATIONS later
- Questions
  - what data must be available?
  - How are data elements to be related?
- RESULT: DATABASE REQUIREMENTS
CONCEPTUAL DESIGN PROCESS

Organize Data Requirements
Group data elements together
Specify Relationships between Groups

RESULT: High Level CONCEPTUAL SCHEMA
- ex: Entity Relationship Diagram
- Level of DESIGN, not CONCEPTUAL LEVEL of DBMS Architecture
LOGICAL DESIGN for DATA MODEL

- Implement High Level CONCEPTUAL SCHEMA in some Database
- Use DATA MODEL of that DB: Relational, Network, OO...
- RESULT: Database CONCEPTUAL SCHEMA
  - In RDB, Table Schemas and Constraints
PHYSICAL DESIGN

• Incorporated knowledge of how the data will be used:
  – from the operations analysis

• RESULT: INTERNAL SCHEMA
  – Layout
  – Clustering (what tables near other tables for faster disk access)
  – Access methods: B-Tree, Hash Table, Indexes
Database Design Process

Requirements Collection

Database Requirements

Conceptual Design

High Level Conceptual Sch.

Logical Design

Database Conceptual Sch.

Physical Design

Database Internal Sch.
OPERATIONS DESIGN PROCESS

Parallels DATA Design Process
REQUIREMENTS COLLECTION & ANALYSIS

• Discover OPERATIONS requirements
  – Interaction with the customer
• Questions
  – How will data be used?
  – Estimated Frequency of Operations
• RESULT: FUNCTIONAL REQUIREMENTS
FUNCTIONAL ANALYSIS

• Requirements are broken down into operations and sequences
• List of the transactions known to be required
• RESULT: High Level TRANSACTION SPECS
  – Info needed for PHYSICAL DESIGN of DB
APPLICATION PROGRAM DESIGN

• Can plan LOGIC of programs without full knowledge of final DB design
• RESULT: Program Skeleton
TRANSACTION IMPLEMENTATION

• Requires at least CONCEPTUAL DB DESIGN
• RESULT: APPLICATION PROGRAMS
Operations Design Process

1. Requirements Collection
2. Functional Requirements
3. Functional Analysis
4. High Level Transaction Specs
5. Program Design
6. Program Skeleton
7. Application Programs
8. Transaction Implementation
Oracle Designer

CASE Tool
– Computer Assisted S/W Engineering
Builds Database from ERDs
Builds Beginnings of Applications for DB
– Same look & feel
– Finish with Oracle Developer
High Level Diagrams ⇒ DB & Apps.

• Build ERD (in Oracle Dialect)
• **Build Model of business operations using one of several tools**
  – Business Process Modeller
  – Data Flow Diagrammer
  – Hierarchical Input Output (HIPO) chart
• **Cross check**
  – Is all data mentioned in model found in ERD?
  – Is all data collected in ERD needed in model?
ERD to DB Diagram

- “Click” ➔ Database diagram
- Fill-out-forms for DB fields
  - All caps
  - Limited set of values
  - Always show as Dropdown List
- “Click” ➔ DDL for DB
  - Create Table statements
  - Package of triggers enforcing constraints for each table
Model to Applications

“Click”: Model + DB Diag → Raw Apps
Overall styling, look & feel with Designer
Final perfection with Oracle Developer, a tool like Visual Basic.
This Course

Entity Relationship Diagram

Database Diagram

DDL

Go to Biz School for modeling.