STA261
MANAJEMEN DATA RELASIONAL

Lingkungan dan Pengembangan Basis Data

DEPARTEMEN STATISTIKA
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
INSTITUT PERTANIAN BOGOR

SEMESTER GANJIL 2021/2022

Komponen Lingkungan Basis Data

- Perangkat pemodelan data dan perancangan
- Repositori
- DBMS
- Basis data
- Program aplikasi
- Antarmuka pengguna
- Administrator data dan basis data
- Pengembang sistem
- Pengguna basis data

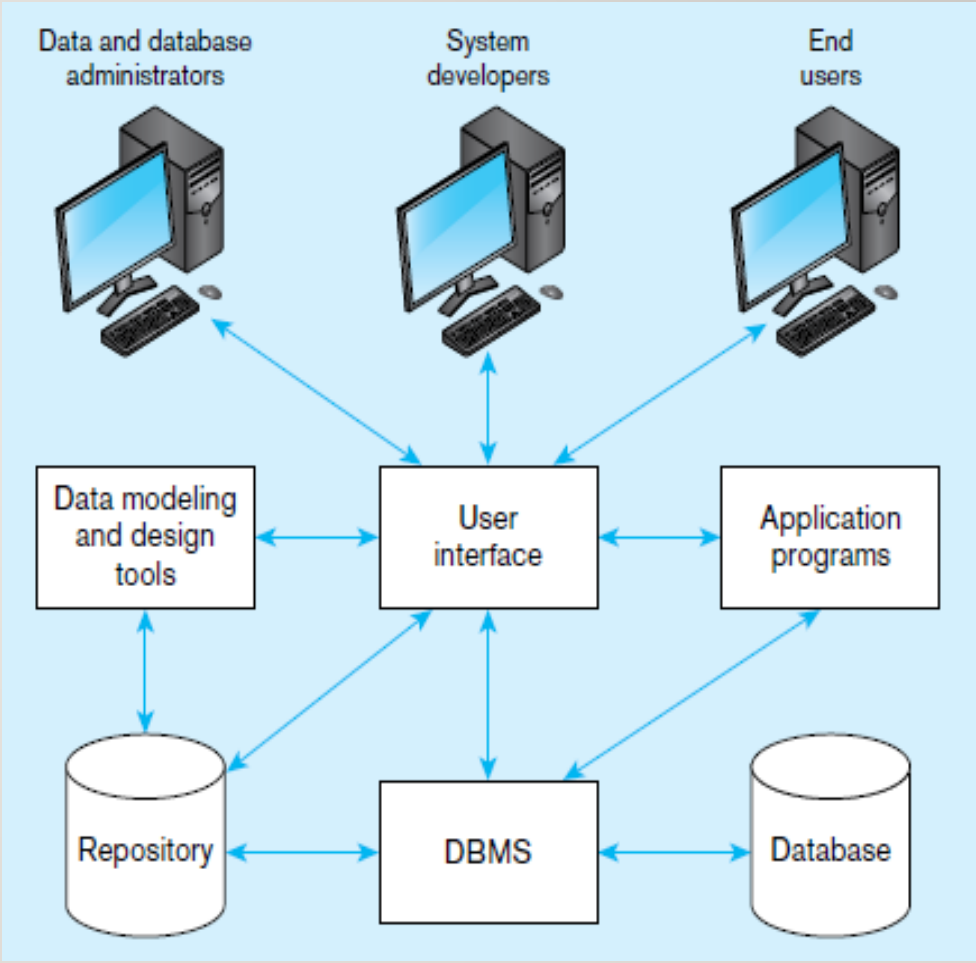
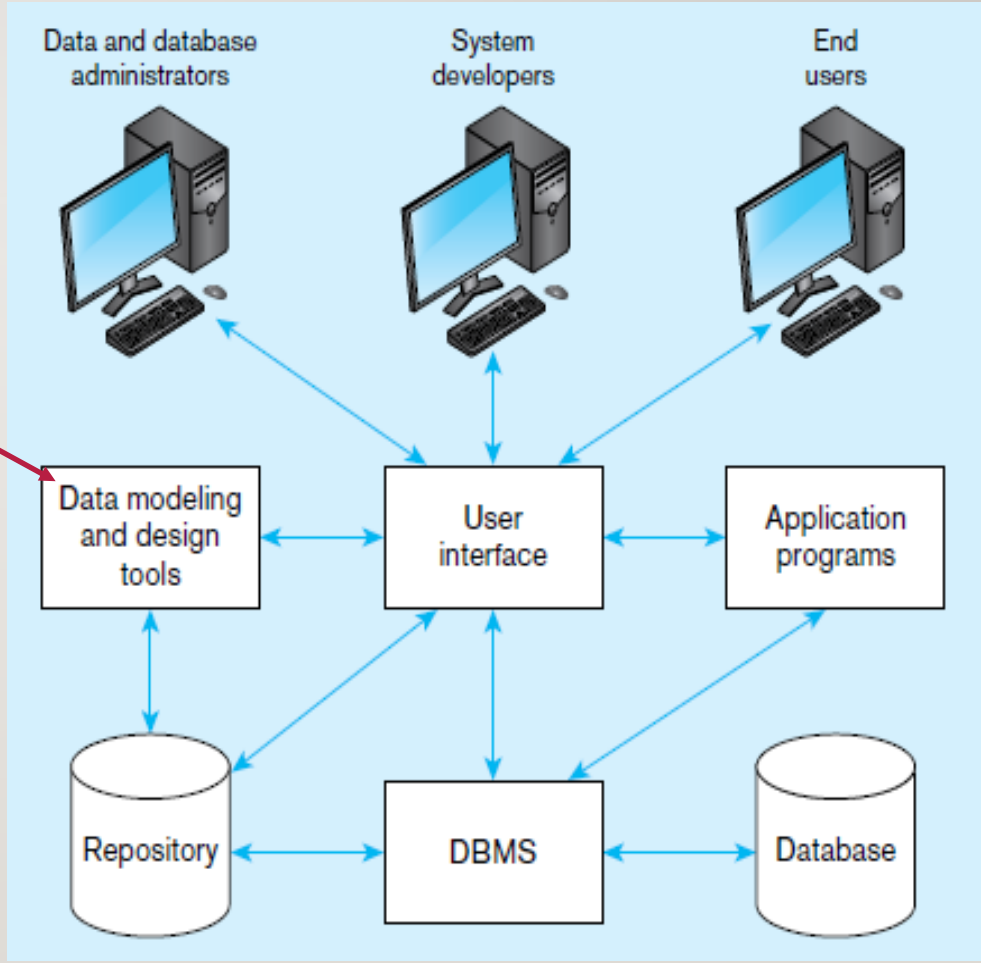
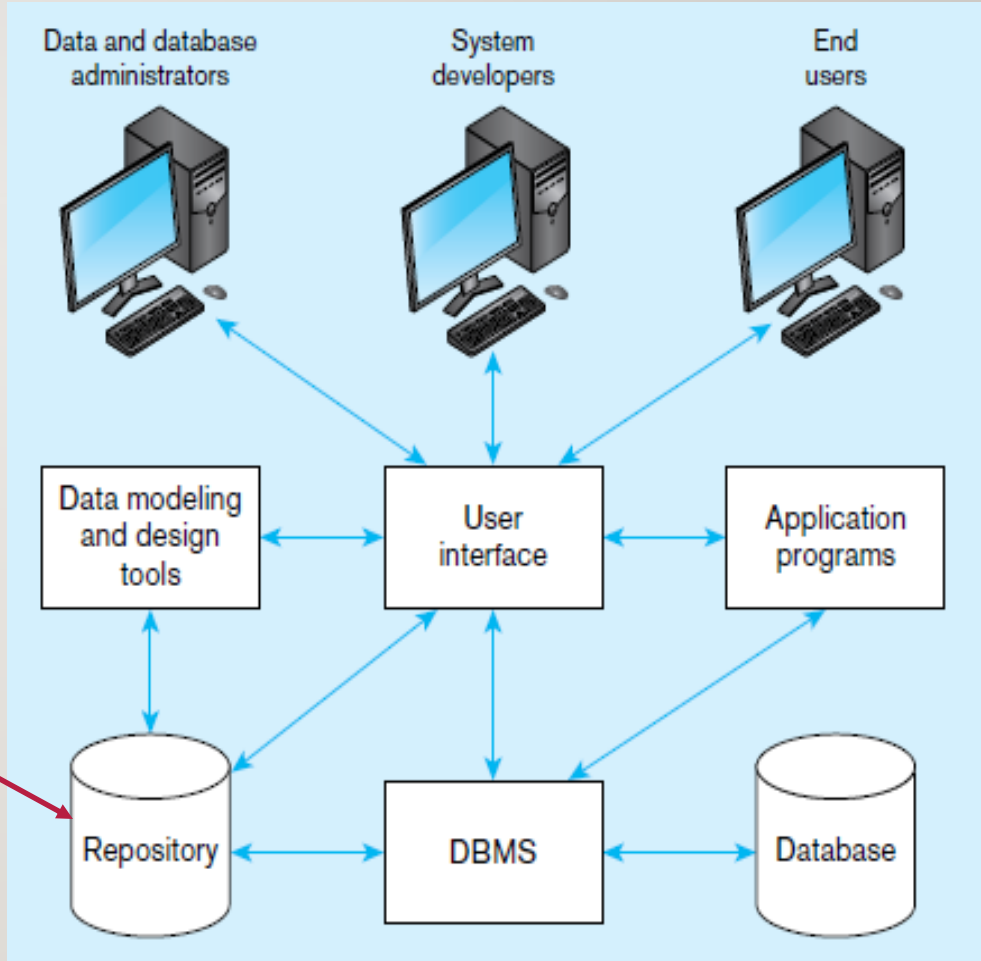


Figure 1-5 Components of the database environment

1. **Perangkat pemodelan data dan perancangan**
   - ✓ Software tools that provide automated support for creating **data models**
   - ✓ Automated tools used to design **databases** and **application programs**.
   - ✓ creation of data models and in some cases can also help automatically generate the "**code**" needed to create the database

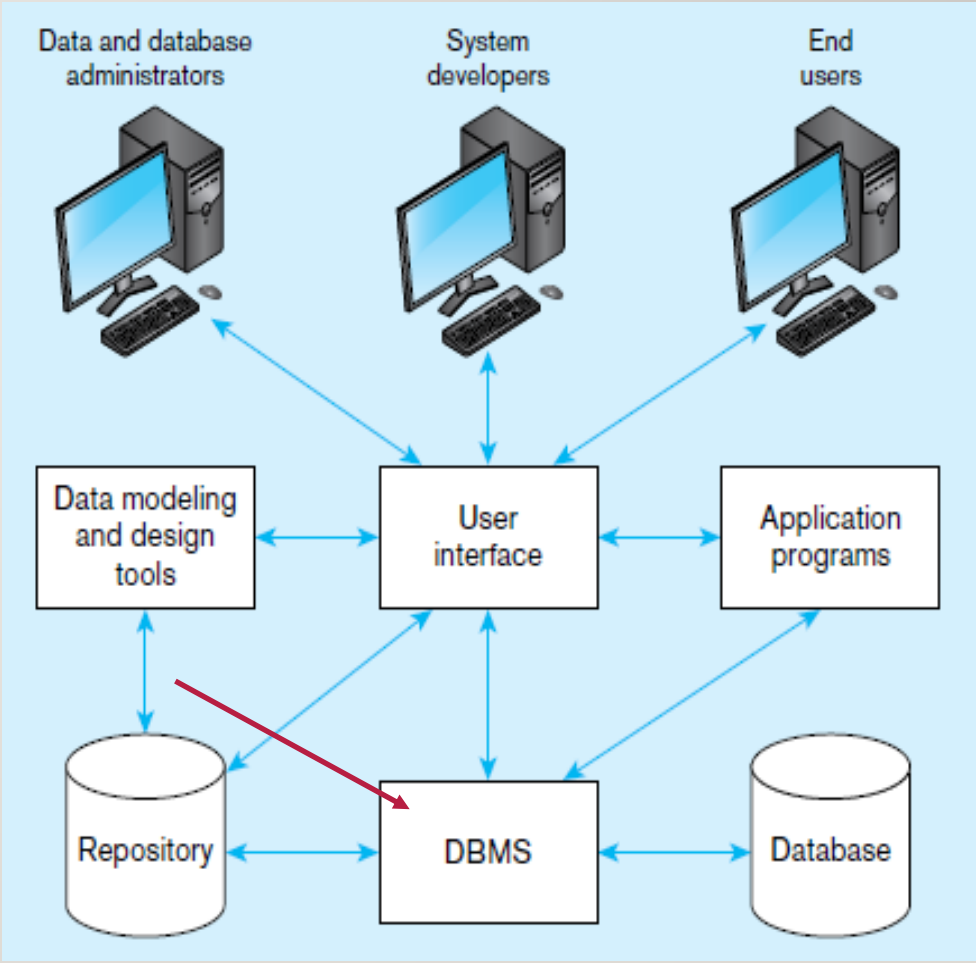


2. **Repositori**
   - ✓ a centralized **knowledge base** for all data definitions, data relationships, screen and report formats, and other system components.
   - ✓ contains an extended set of **metadata** important for managing databases as well as other components of an information system.
   - ✓ contains **definitions of data**

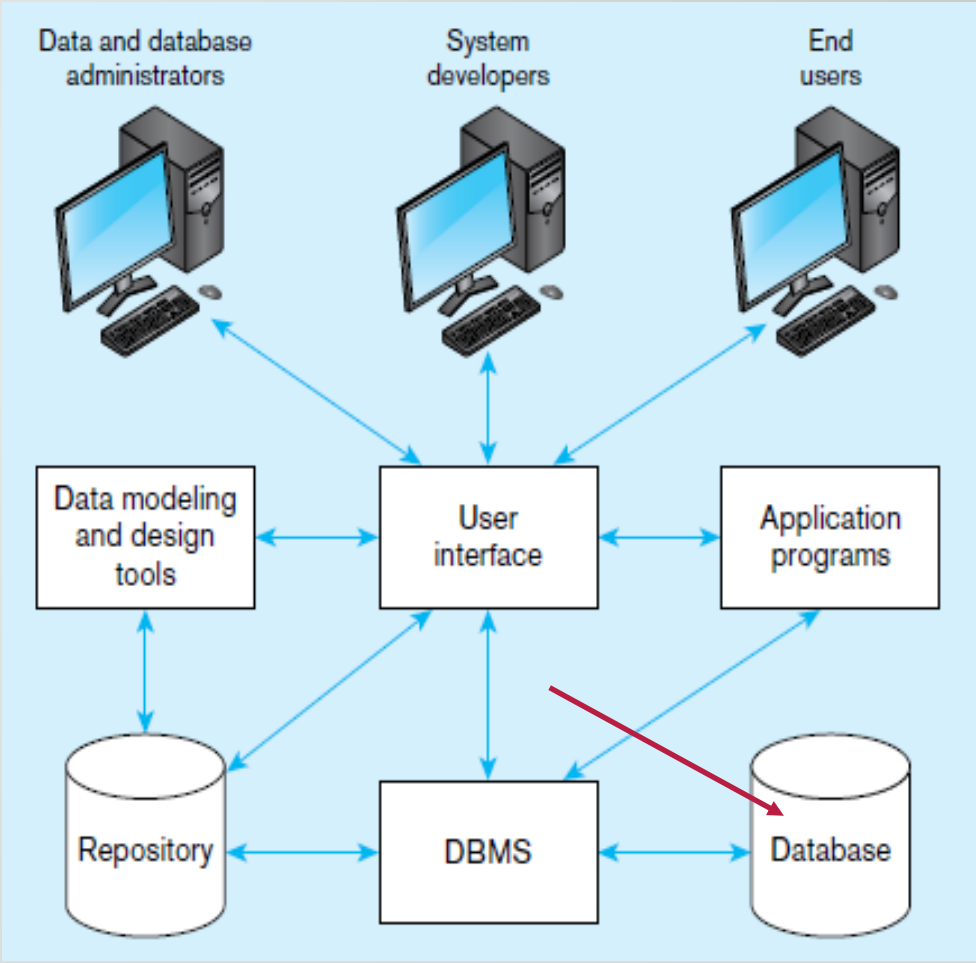


3. DBMS

- ✓ a **software system** that is used to create, maintain, and provide controlled access to user databases

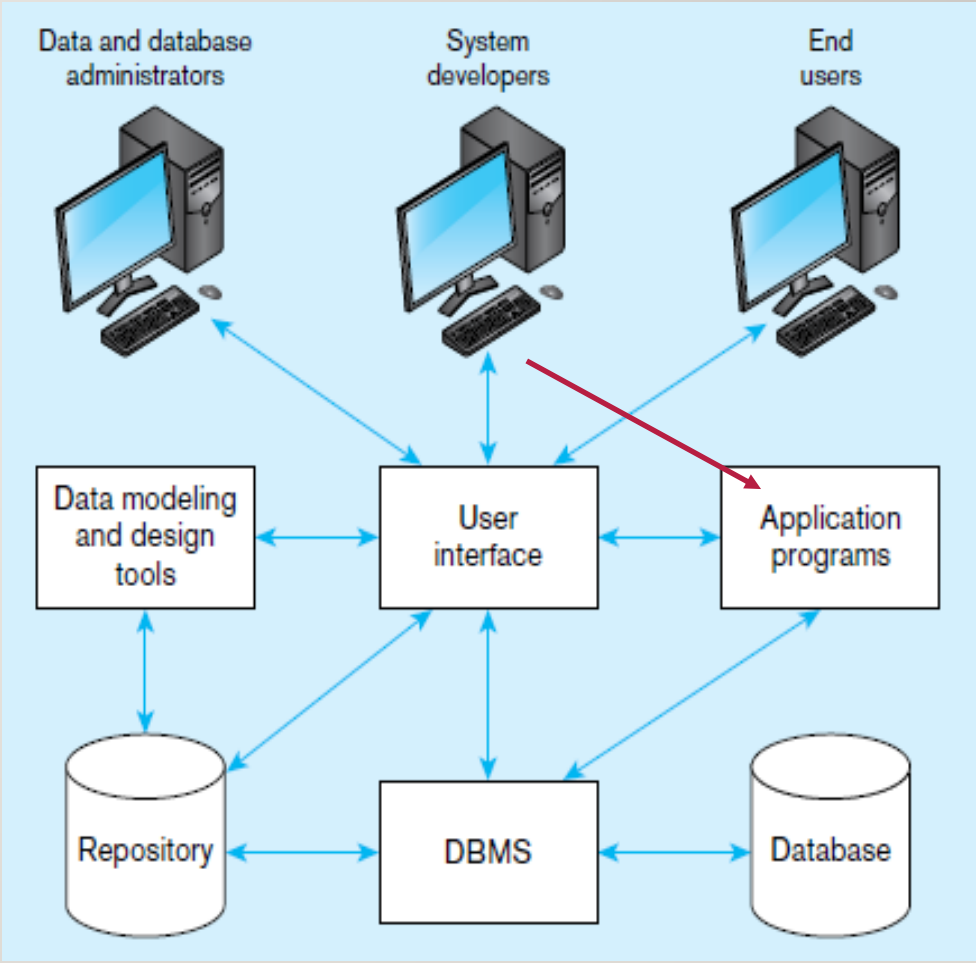


4. **Basis Data**
   - ✓ an organized **collection** of logically related data, usually designed to meet the information needs of multiple users in an organization.
   - ✓ database contains **occurrences of data**



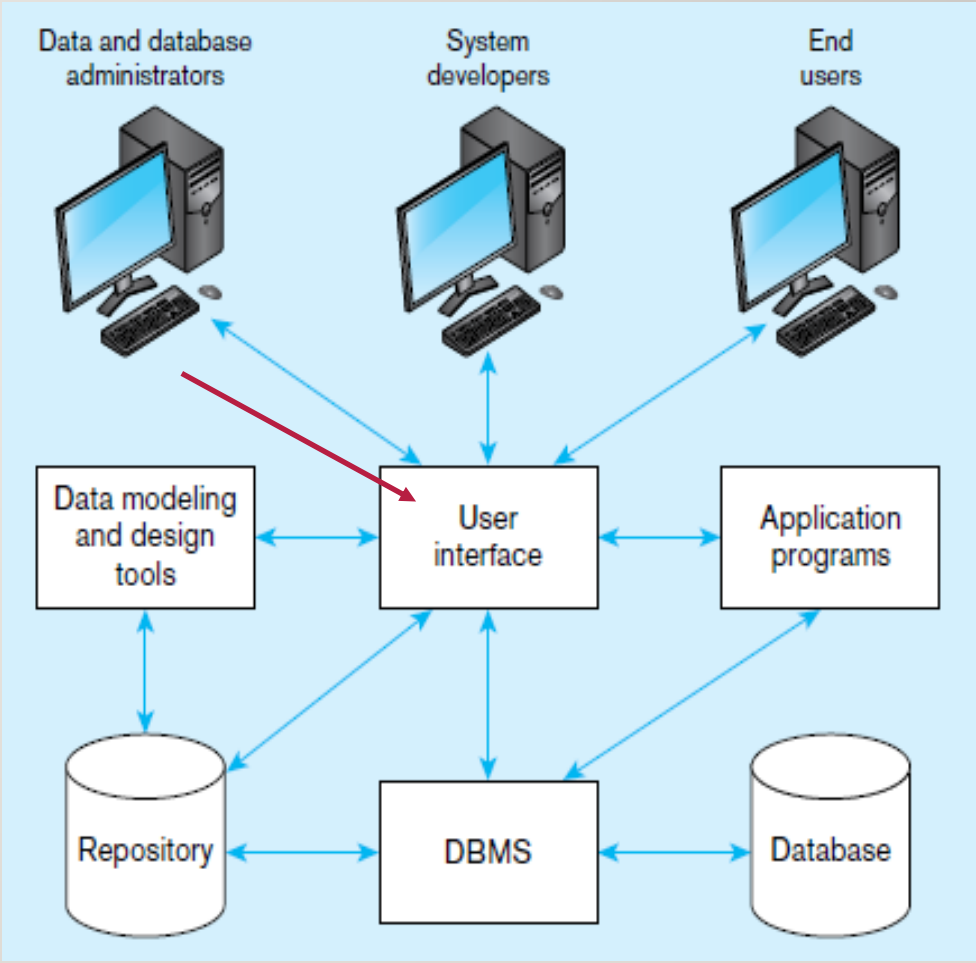
5. **Program Applikasi**

   - ✓ **Computer-based** application programs are used to create and maintain the database and provide information to users

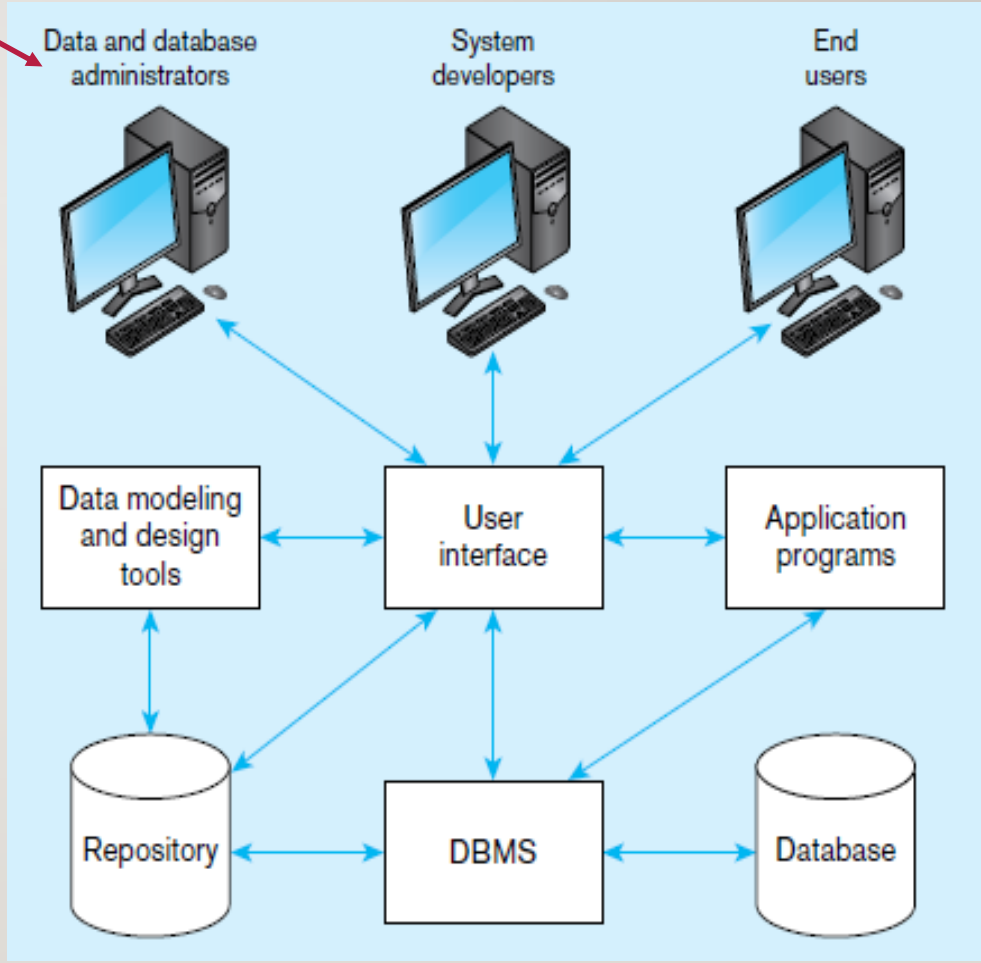


6. Antarmuka Pengguna

- ✓ includes languages, menus, and other facilities by which **users interact** with various system components, such as data modeling and design tools, application programs, the DBMS, and the repository

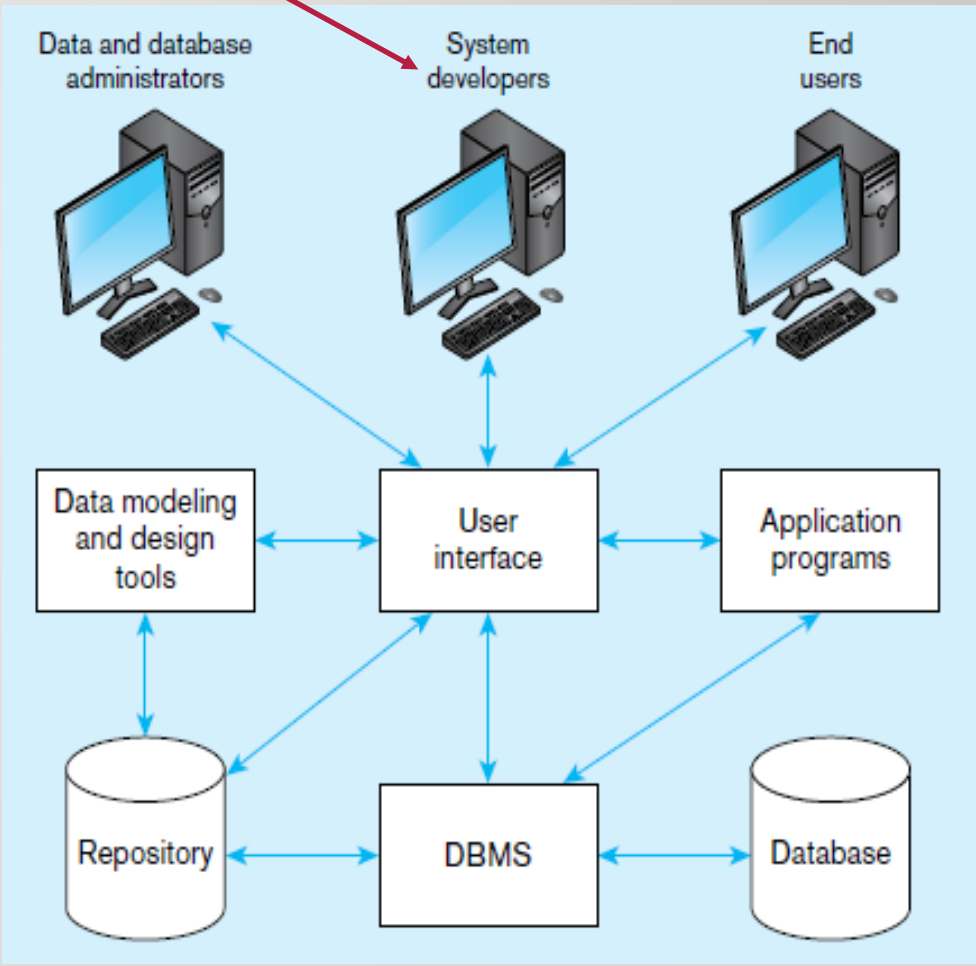


7. **Administrator Data dan basis data**
   - ✓ persons who are **responsible** for the overall **management** of data resources in an organization
   - ✓ responsible for **physical database design** and for managing technical issues in the database environment

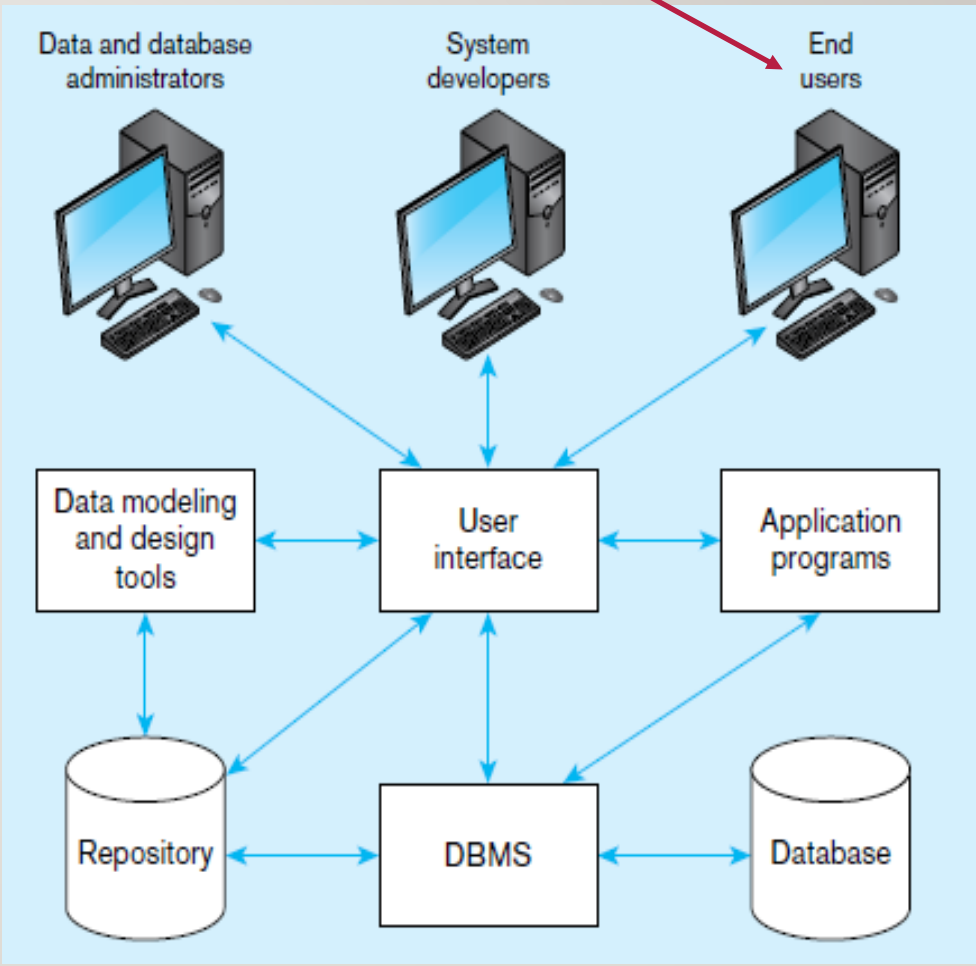


8. **Pengembang sistem**

   ✓ persons such as **systems analysts** and **programmers** who design new application programs



9. **Pengguna Basis Data**
   - ✓ persons throughout the organization who **add**, **delete**, and **modify** data in the database and who request or receive **information** from it
   - ✓ all user interactions with the database must be routed through the **DBMS**



Proses Pengembangan Basis Data

- Pengembangan basis data mulai dengan **enterprise data modeling**, yang menetapkan cakupan dan isi basis data.
- Tujuannya adalah untuk membuat gambaran umum atau menjelaskan data institusi, bukan merancang basis data suatu bagian.
- Hubungan antara keluaran (output) dan data sering disajikan dalam bentuk **matrik**.

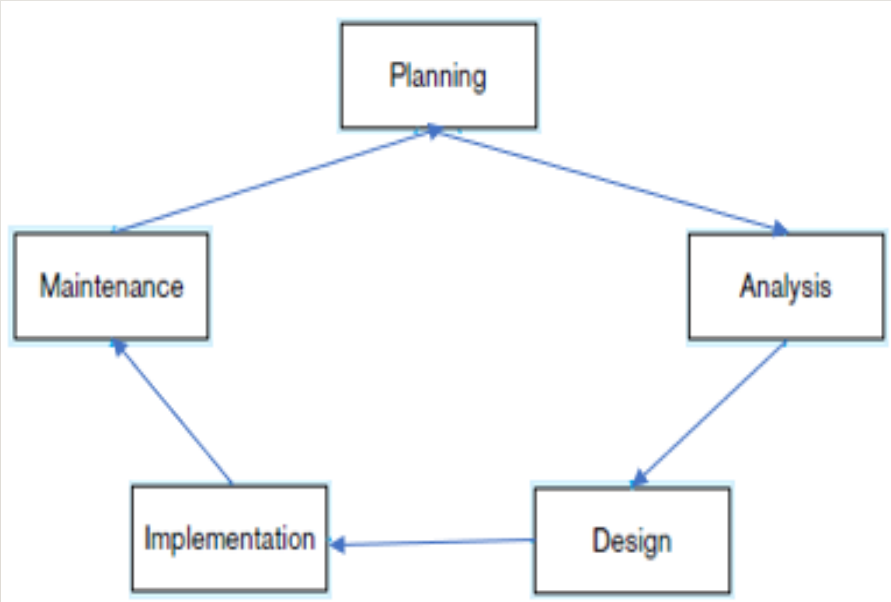
Business Functions \ Data Entity Types	Customer	Product	Raw Material	Order	Work Center	Work Order	Invoice	Equipment	Employee
Business Planning	X	X						X	X
Product Development		X	X		X			X	
Materials Management		X	X	X	X	X		X	
Order Fulfillment	X	X	X	X	X	X	X	X	X
Order Shipment	X	X		X	X		X		X
Sales Summarization	X	X		X			X		X
Production Operations		X	X	X	X	X		X	X
Finance and Accounting	X	X	X	X	X		X	X	X

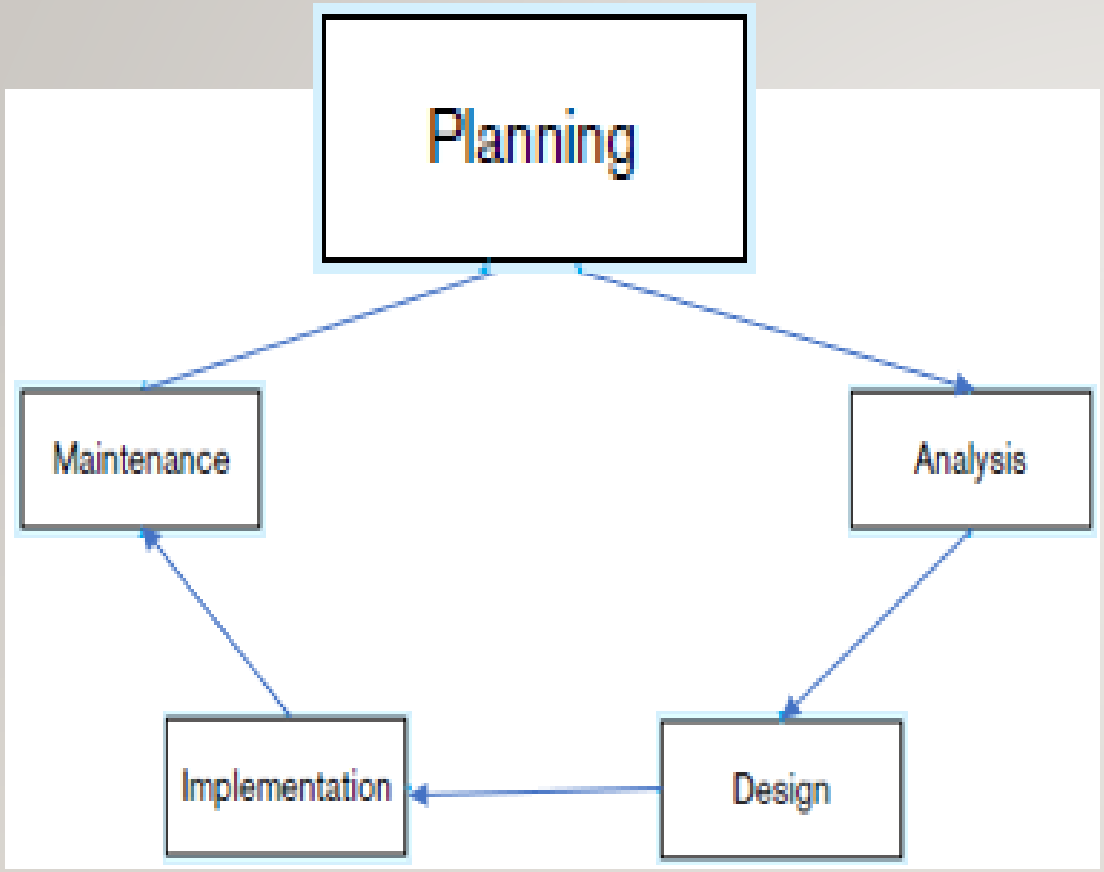
X = data entity is used within business function

Figure 1-6 Example business function-to-data entity matrix

Siklus Pengembangan Sistem (SDLC)

- ✓ Proses pengembangan sistem informasi.
- ✓ Tahapan proses mencakup perencanaan, analisis, perancangan, implementasi, dan memelihara sistem informasi.

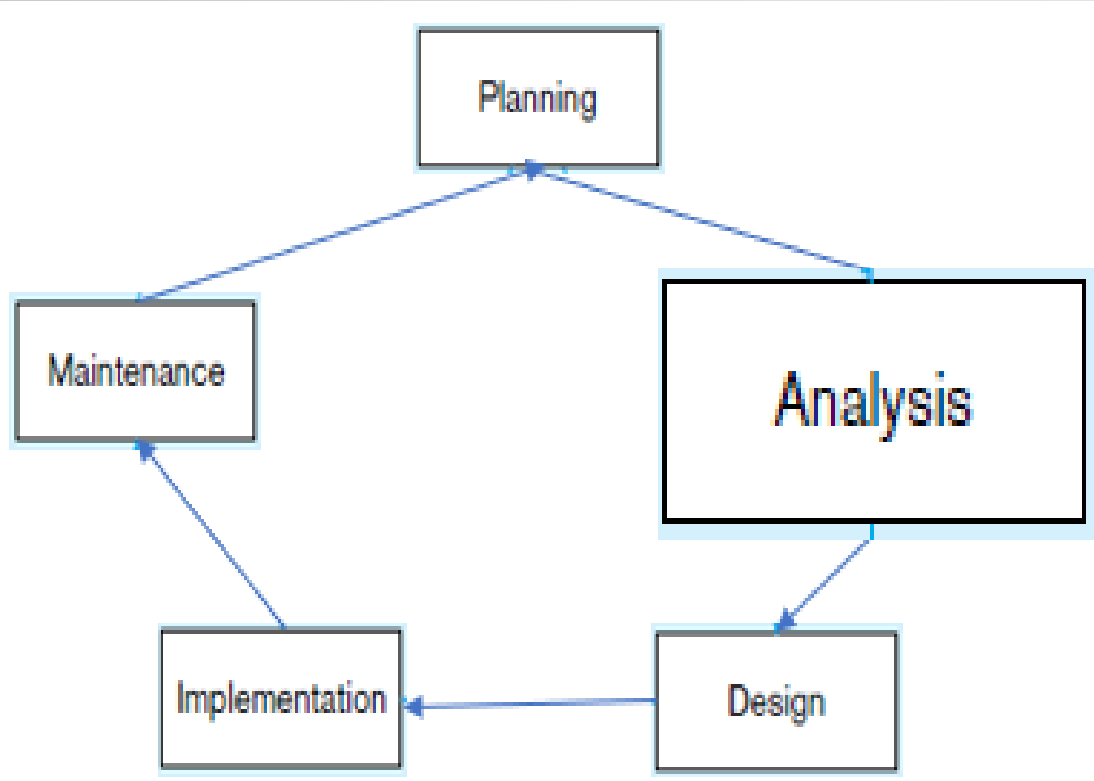




Perencanaan

Memahami keadaan institusi dan bagaimana sistem information yang akan dibangun membantu penyelesaian masalah.

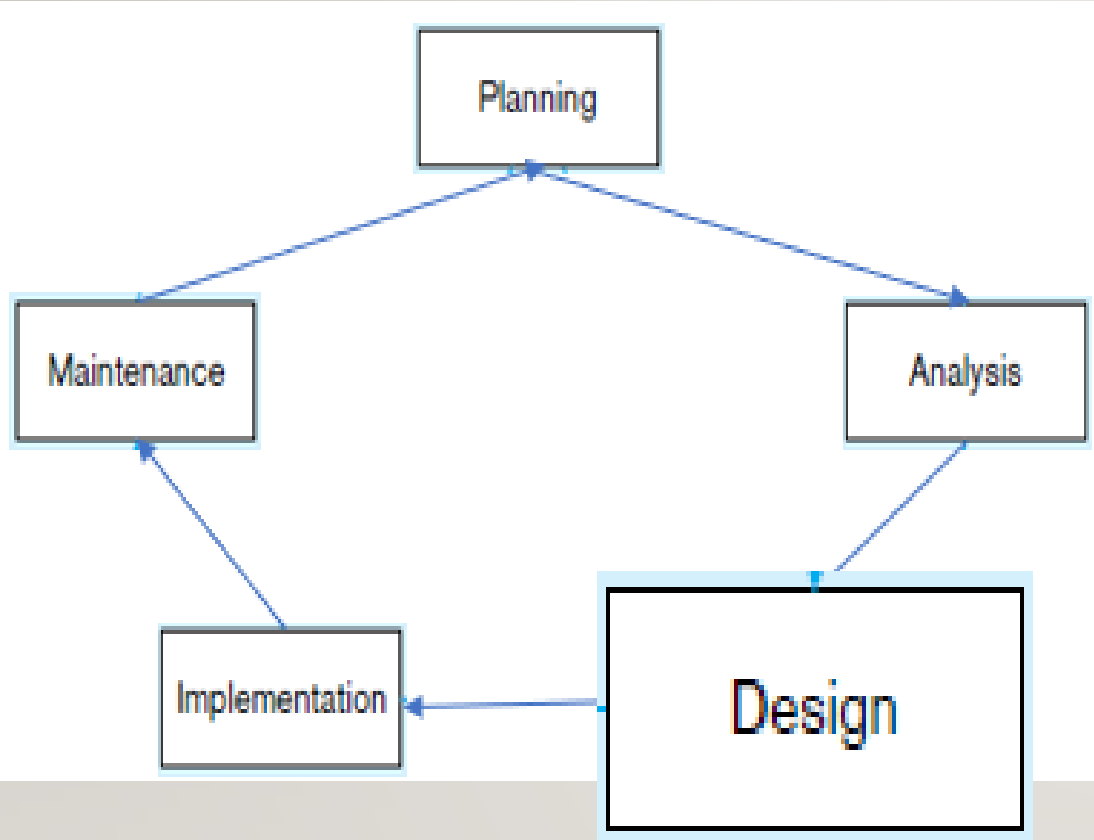
- **Enterprise modeling**
  - Analisis pengolahan data saat ini
  - Analisis kebutuhan basis data, termasuk data terbaru, untuk menunjang bagian-bagian dalam institusi
- **Conceptual data modeling**
  - Identifikasi cakupan kebutuhan basis data untuk sistem informasi
  - Analisis kebutuhan data secara keseluruhan untuk bagian-bagian dalam institusi



Analisis

Menganalisis untuk menentukan kebutuhan basis data

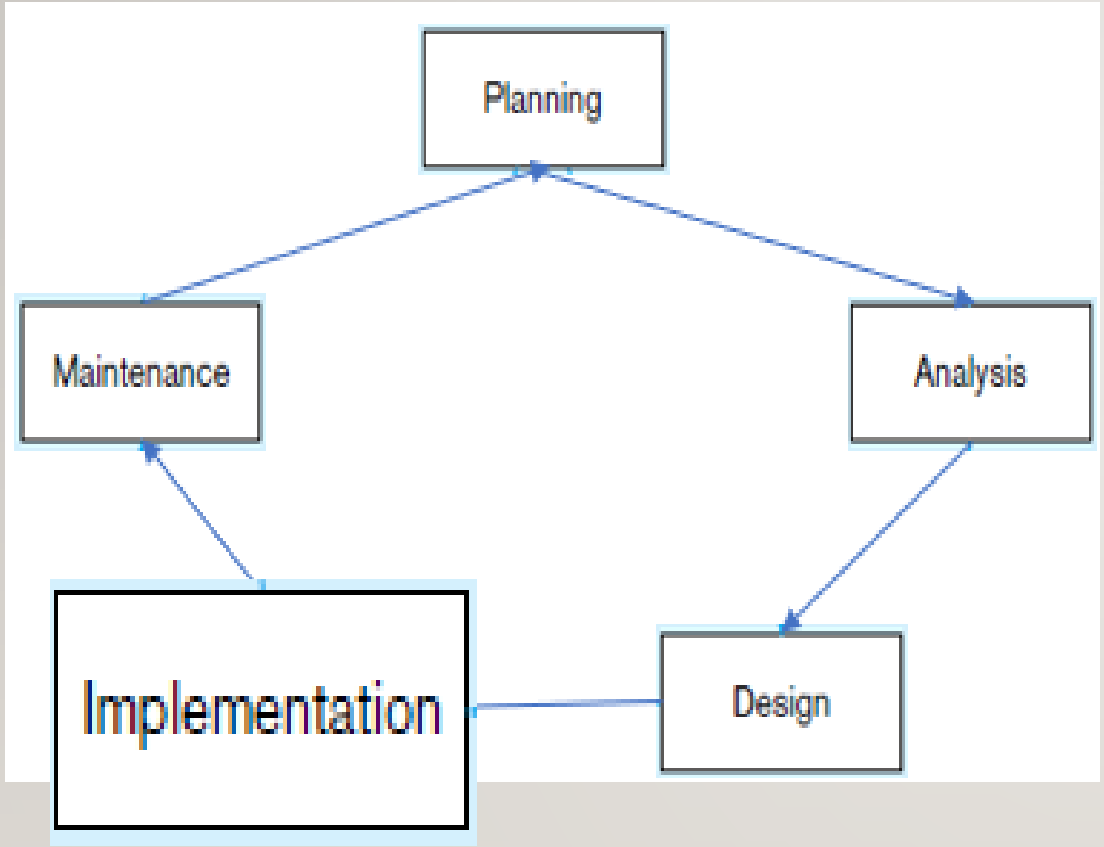
- **Conceptual data modeling**
  - Menyusun model awal data konseptual, termasuk entity-entiti dan hubungan antar entiti
  - Membandingkan model data tersebut dengan **enterprise data model**
  - Menyusun secara rinci conceptual data model, termasuk entity-entiti, hubungan antar entiti, dan atribute-atributnya sesuai dengan model sistem informasinya



Perancangan

Menetapkan struktur kebutuhan informasi dan spesifikasi teknologinya

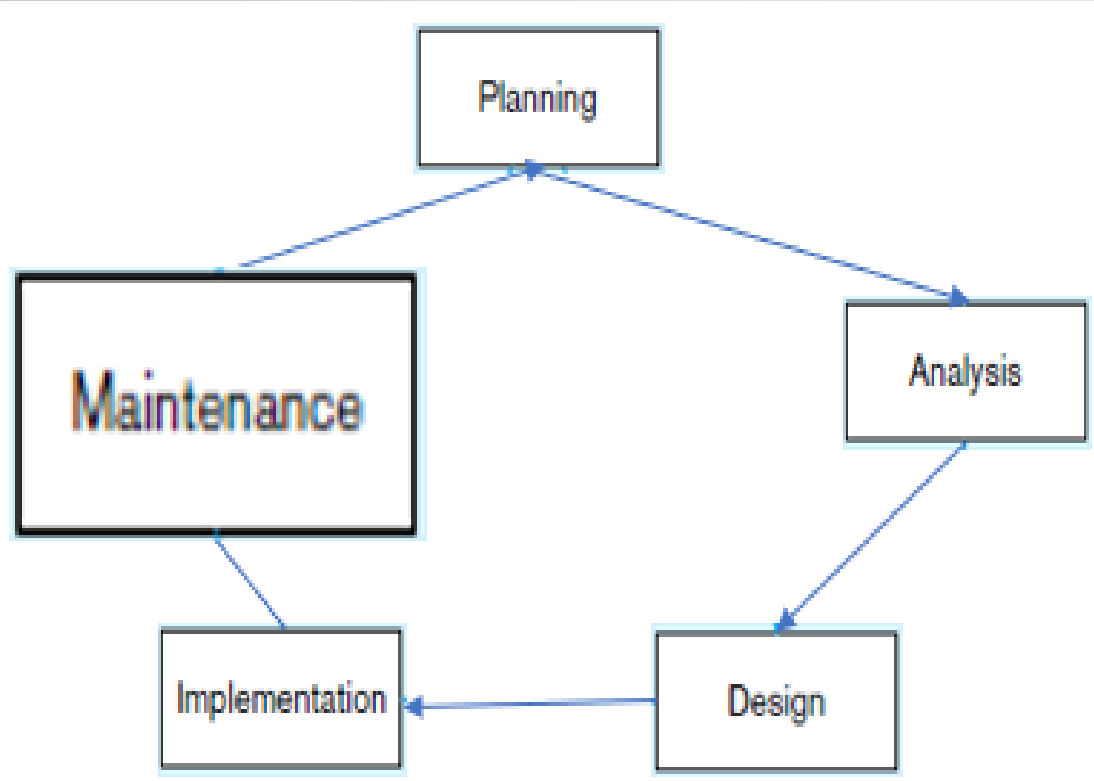
- **Logical database design**
  - Menganalisis secara rinci jenis transaksi dan bentuk tampilan-tampilan yang akan diperoleh dari basis data
  - Mengintegrasikan tampila-tampilan dengan conceptual data model
  - Mengidentifikasi kebutuhan *data integrity* dan keamanan data
- **Physical database design and definition**
  - Mendefinisikan basis data pada DBMS
  - Menetapkan struktur data secara fisik
  - Merancang program-progam untuk pengolahan basis data



Implementasi

Menyusun program-program, membentuk basis data, ujicoba dan memasang sistem, melatih pengguna, dan menyiapkan dokumentasi

- **Database implementation**
  - Menyusun dan uji coba program-program pengolahan basis data
  - Melengkapi dokumentasi dan bahan pelatihan
  - Menginstal basis data dan menkonversi data dari sistem sebelumnya



Pemeliharaan

Memantau kelancaran sistem beroperasi sesuai dengan kegunaannya dan memperbaiki sistem seandainya terjadi kesalahan

- **Database maintenance**
  - Menganalisis basis data dan program-program aplikasinya untuk menjamin kebutuhan informasi terpenuhi
  - Meningkatkan performa basis data
  - Memperbaiki kesalahan dalam basis data dan program aplikasinya

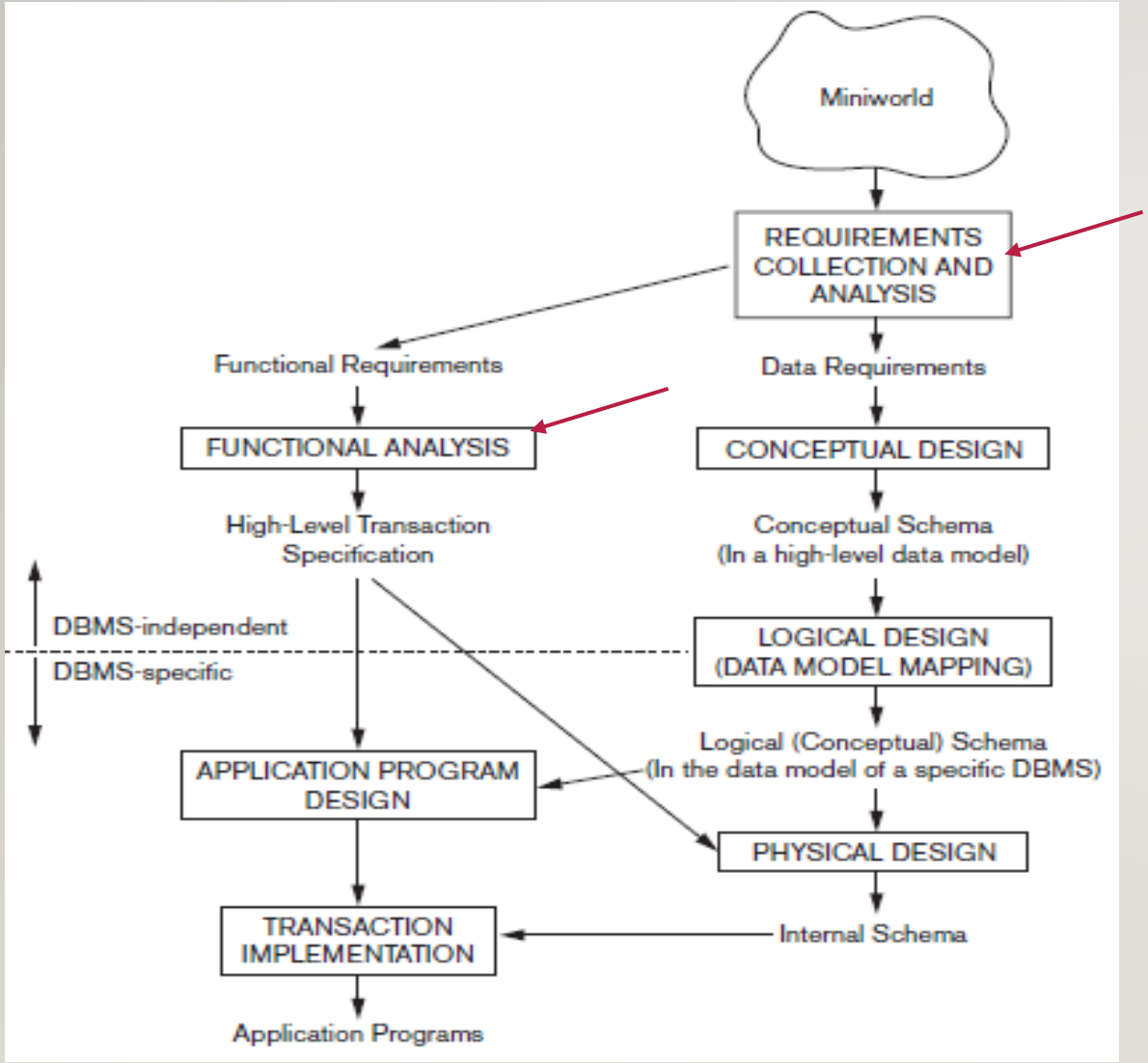


Figure 3.1 A simplified diagram to illustrate the main phases of database design

Tahapan Perancangan Basis Data

1. Pengumpulan kebutuhan dan analisis

- Perancang basis data mengumpulkan bahan-bahan yang diperlukan melalui wawancara dengan pengguna dan dokumen-dokumen, termasuk menyusun berbagai fungsi transaksi yang akan diterapkan untuk mengambil dan perubahan data dalam basis data

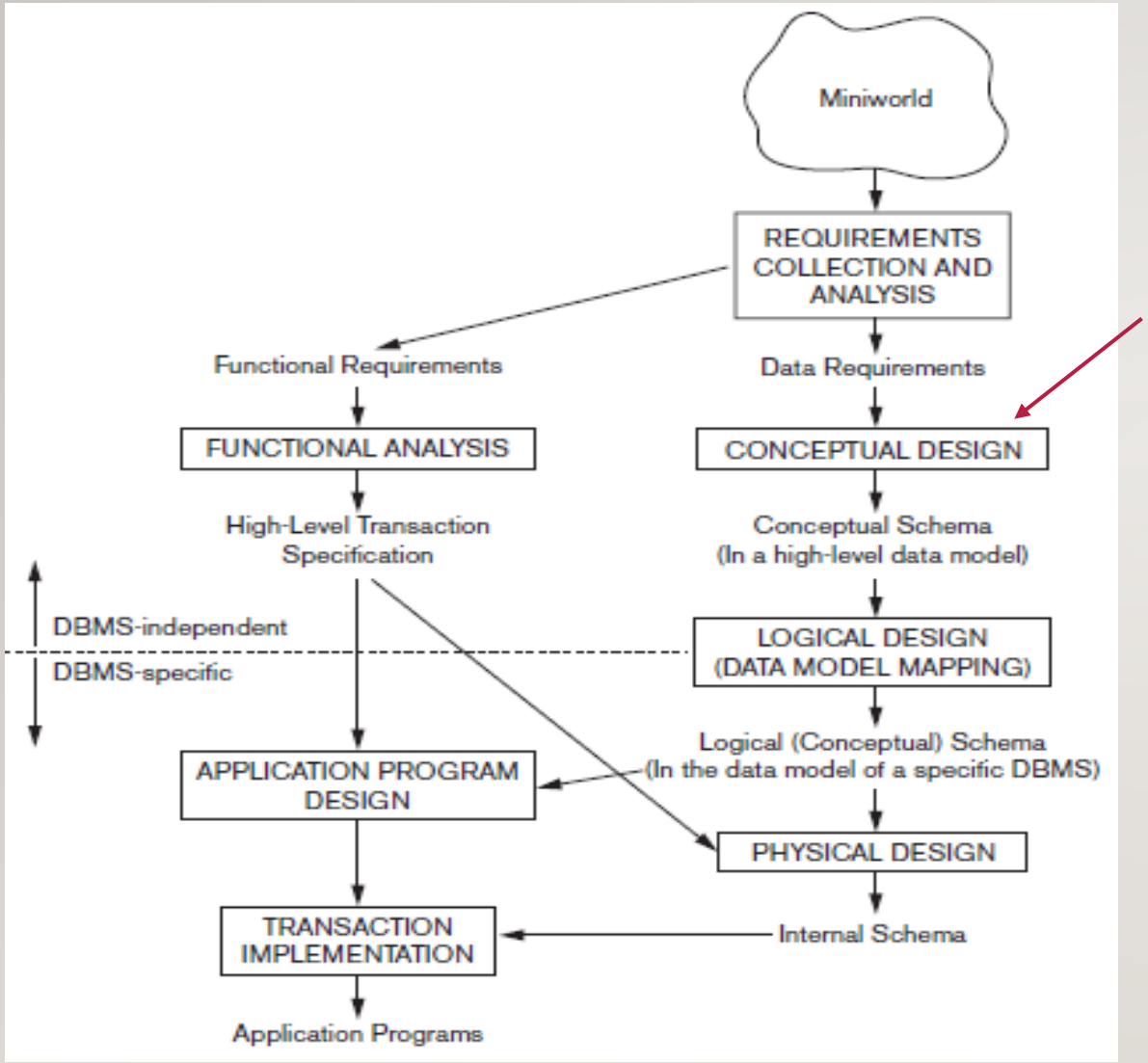


Figure 3.1 A simplified diagram to illustrate the main phases of database design

2. Rancangan Konseptual

- Membuat skema konseptual untuk basis data, menggunakan model data konseptual high-level
- Skema konseptual adalah deskripsi tentang data yang dibutuhkan pengguna, termasuk deskripsi tentang entity, relationships, and constraints

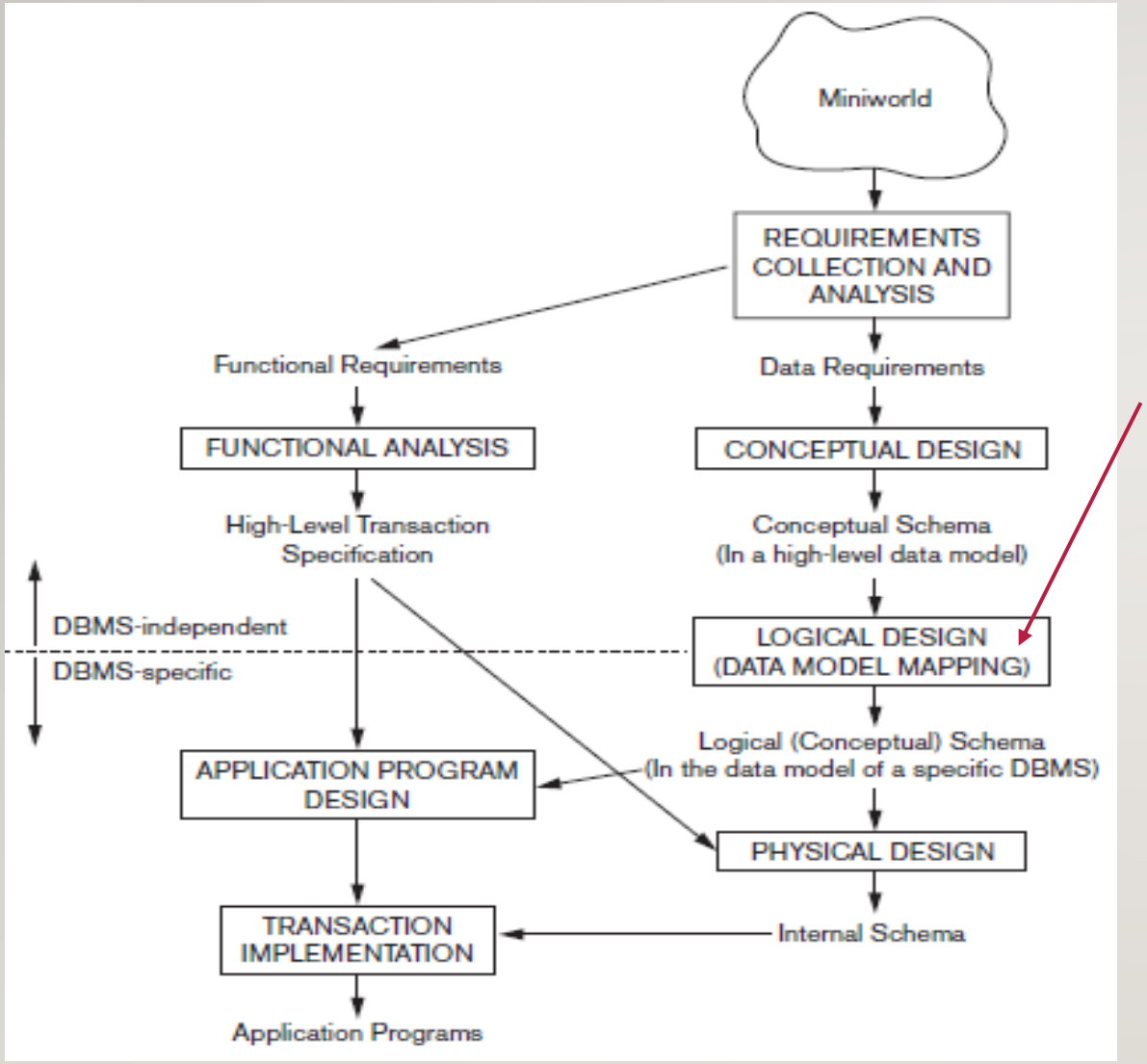


Figure 3.1 A simplified diagram to illustrate the main phases of database design

3. Rancangan Lojik atau Pemetaan Model Data

- Implementasi basis data dengan DBMS seperti SQL untuk model relasional
- Skema konseptual ditransformasi dari model data *high-level* ke model data implementasi
- Hasilnya adalah **skema basis data**

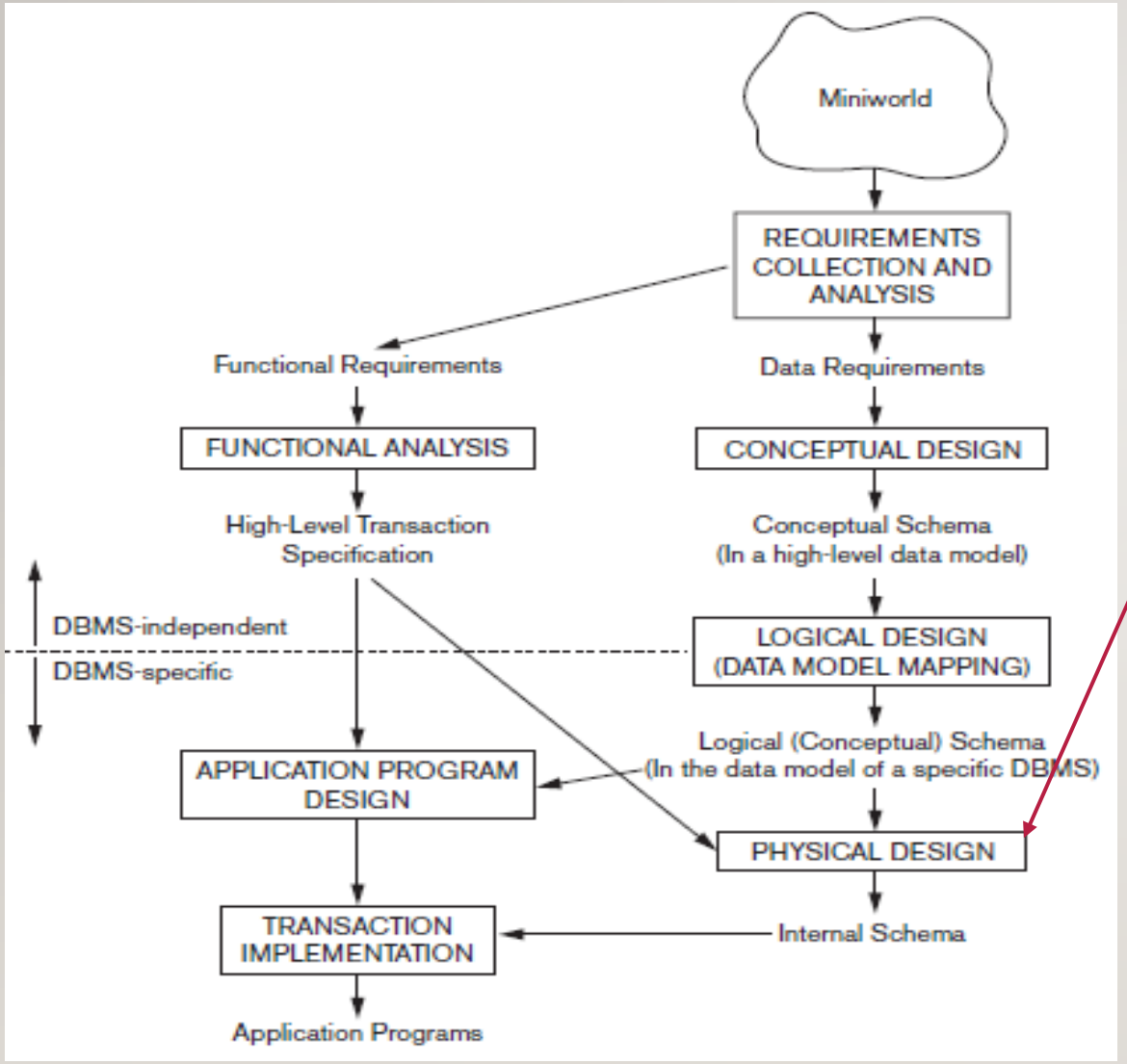
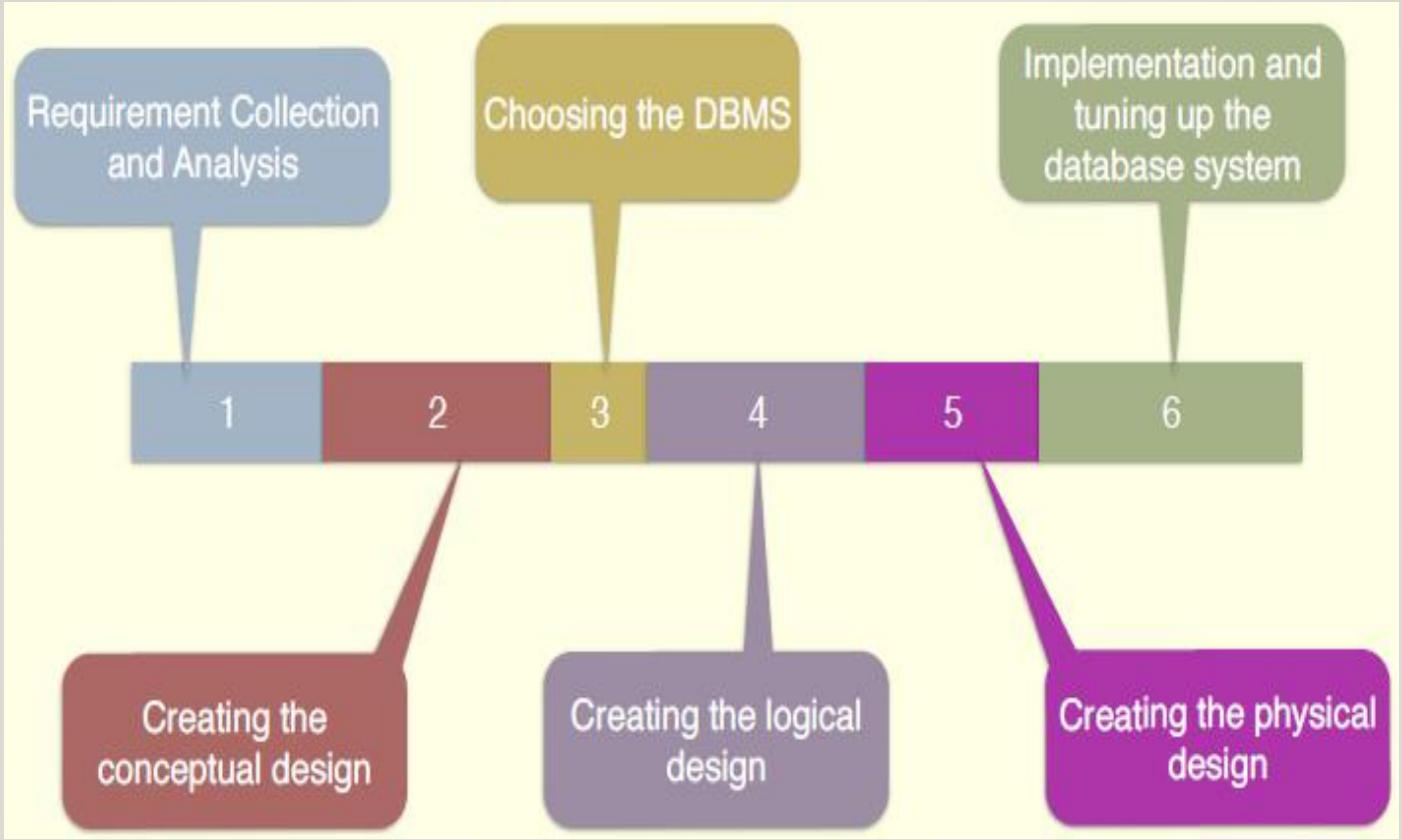


Figure 3.1 A simplified diagram to illustrate the main phases of database design

4. Rancangan Fisik

- **Struktur penyimpanan internal:** file organizations, indexes, access paths, and physical design parameters for the database files are specified
- **Program aplikasi** dirancang dan diimplementasi untuk transaksi ke basis data sesuai dengan spesifikasi transaksi *high-level*

Perancangan Basis Data dan Tahapan Implementasi



A Sample Database

COMPANY:

- Employees, Departments, and Projects.
- is organized into departments.

Department:

- has department name, department number, location, and a manager who manage the department.
- start date that the manager began managing the department.
- may be in several locations.
- controls a number of projects

Project:

- sores project name, project number, and a single location.

Employee:

- stores employee name, social security number, address, salary, sex (gender), and birth date.
- In one department and may work on several projects controlled by the different department.
- the working hours per week on each project
- the direct supervisor of each employee (who is another employee).

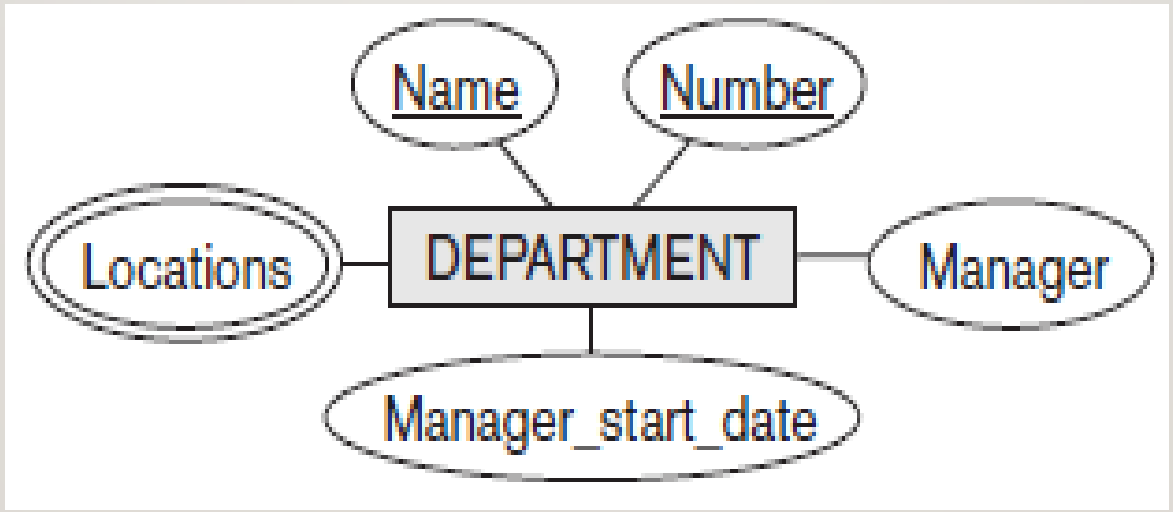
Dependent of employee:

- name, sex (gender), birth date
- relationship between the dependent and the employee

Initial Conceptual Design of the COMPANY Database

- **DEPARTMENT entity**

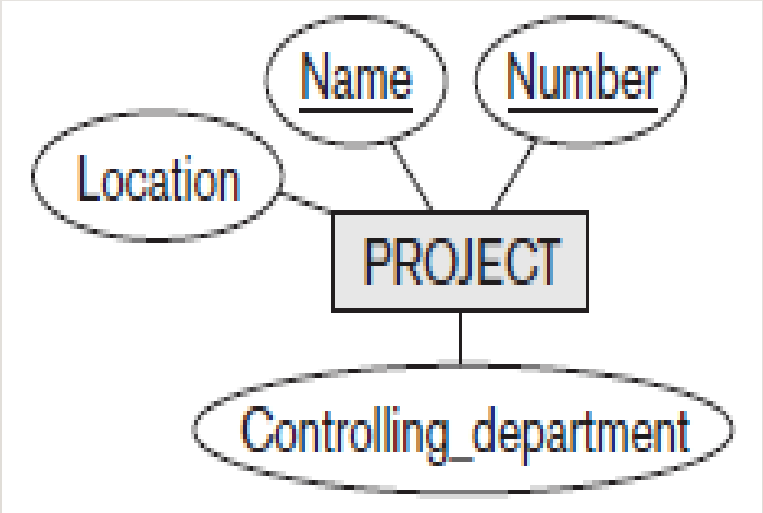
  with attributes Name, Number, Locations, Manager, Manager_start_date, locations as multivalued attribute.



Initial Conceptual Design of the COMPANY Database

- **PROJECT entity**

  with attributes Name, Number, Location, and Controlling_department.



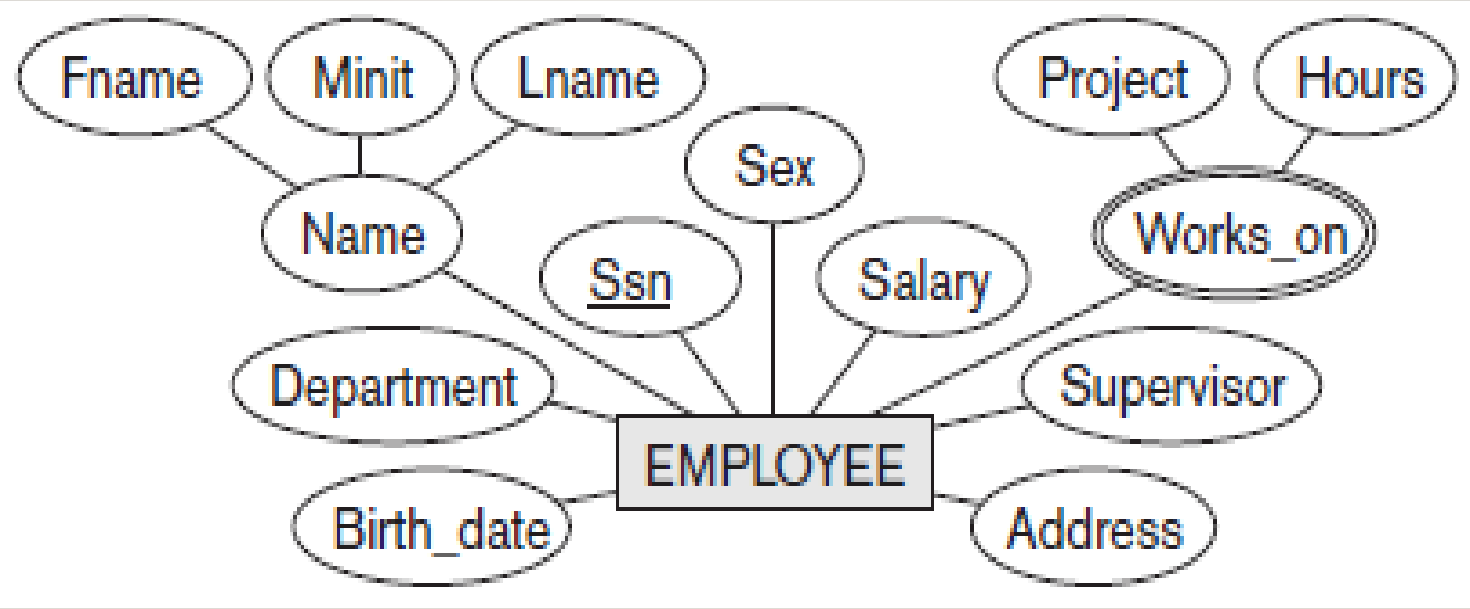
Initial Conceptual Design of the COMPANY Database

- **EMPLOYEE entity**

  with attributes Name, Ssn, Sex, Address, Salary, Birth_date, Department, and Supervisor.

  (Name—First_name, Middle_initial, Last_name)

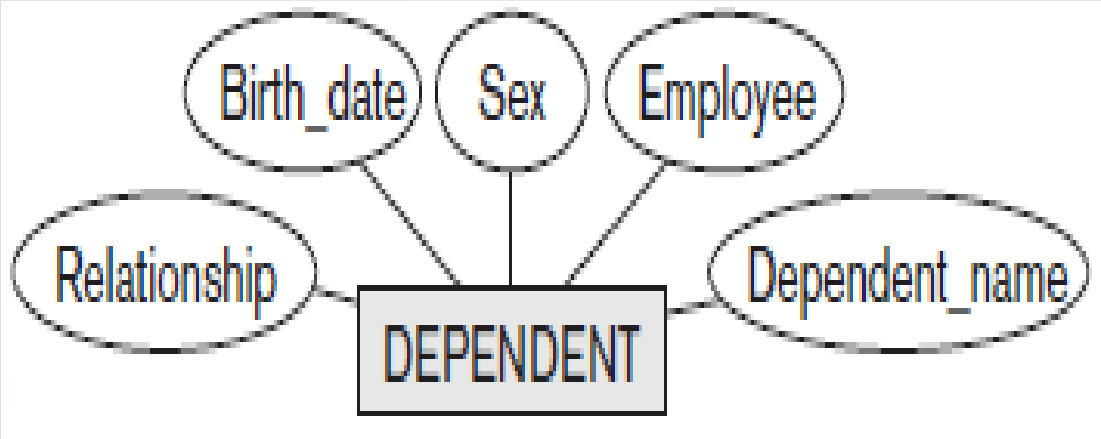
  .



Initial Conceptual Design of the COMPANY Database

- **DEPENDENT entity**

  with attributes Employee, Dependent_name, Sex, Birth_date, and Relationship (to the employee).



One possible database for COMPANY relational database schema

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	30000	333445555	5
Franklin	T	Wong	333445555	1955-12-08	638 Voss, Houston, TX	M	40000	888665555	5
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000	987654321	4
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000	888665555	4
Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak, Humble, TX	M	38000	333445555	5
Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	25000	333445555	5
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000	987654321	4
James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	M	55000	NULL	1

One possible database for COMPANY relational database schema

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

PROJECT

Pname	Pnumber	Plocation	Dnum
ProductX	1	Bellaire	5
ProductY	2	Sugarland	5
ProductZ	3	Houston	5
Computerization	10	Stafford	4
Reorganization	20	Houston	1
Newbenefits	30	Stafford	4

One possible database for COMPANY relational database schema

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship
333445555	Alice	F	1986-04-05	Daughter
333445555	Theodore	M	1983-10-25	Son
333445555	Joy	F	1958-05-03	Spouse
987654321	Abner	M	1942-02-28	Spouse
123456789	Michael	M	1988-01-04	Son
123456789	Alice	F	1988-12-30	Daughter
123456789	Elizabeth	F	1967-05-05	Spouse

DEPT_LOCATIONS

Dnumber	Dlocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

One possible database for COMPANY relational database schema

WORKS_ON

Essn	Pno	Hours
123456789	1	32.5
123456789	2	7.5
666884444	3	40.0
453453453	1	20.0
453453453	2	20.0
333445555	2	10.0
333445555	3	10.0
333445555	10	10.0
333445555	20	10.0
999887777	30	30.0
999887777	10	10.0
987987987	10	35.0
987987987	30	5.0
987654321	30	20.0
987654321	20	15.0
888665555	20	NULL

Latihan:

Perancangan Basis Data untuk data berikut:

1. Data Mahasiswa
2. Data Mata Kuliah
3. Data Fakultas
4. Data Program Studi

Buatlah:

- Model konseptual basis data untuk entity-entity tersebut untuk perancangan basis data relasional

Lingkungan dan Pengembangan Basis Data