Data Base System
Week 5ᵗʰ   Topics

- Database Development & Design

- Database Development Strategies

- DBDLC

Data Base System
Week 5th   Topics

Database Development Process

- is a lengthy and complicated process

General Strategies

- A DB is developed to satisfy the requirements of the users and understand these requirements in detail
- the requirements should be defined as early as possible

1. **Top-Down Approach**

- **S**tarting from general issues and moves to specific issues
- First of all to find out general goals of the organization and how to achieve these goals
- The requirements should be defined to reach these goals

2. **Bottom-Up Approach**

- **S**tarting from specific issues and moves to general issues
- To develop a specific system
- Requirements are found by studying the existing system and interviewing different users

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Database Development Life Cycle

▪ A repetitive process in which system may be manipulated, upgraded, matured in its operations and may introduce new hardware and software technologies due to environmental changes(Government policies or users demands)

▪ It is a complex and tedious process and a conventional way to develop an information system

▪ The stages (steps) involved are not logical but involve some repetition

▪ Either for new or to upgrade a system

▪ correcting faults,

▪ implementing new user requirements,

▪ modifying software to run on new or upgraded platforms.

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Database Development Life Cycle

Software Depression

As a result, many major software projects were

- Late
- over budget,

➤ unreliable,

➤ difficult to maintain,

➤ performed poorly.

- In late 1960s, led to 'software crisis', now refer to as the 'software depression'

- Major reasons for failure of software projects includes:

    - lack of a complete requirements specification;

    - lack of appropriate development methodology;

    - poor decomposition of design into manageable components.

- Structured approach to development was proposed called information systems lifecycle.

Information System

Resources that enable collection, management, control, and dissemination of information throughout an organization.

Data Base System
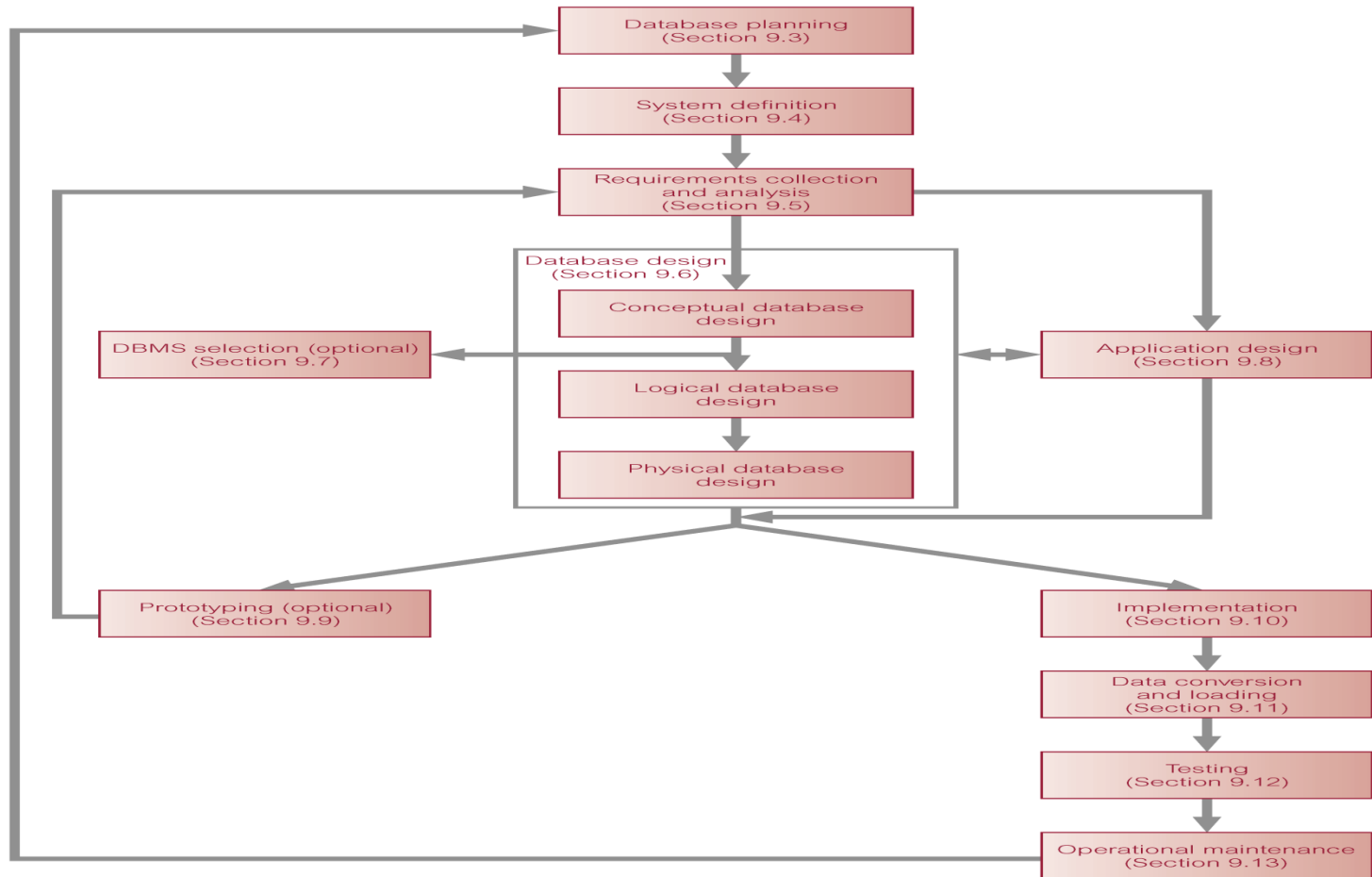## Week 5th   Topics

Database Development Life Cycle

Database is fundamental component of I.S., and its development/usage should be viewed from perspective of the wider requirements of the organization

Steps in DBDLC

- Database planning
- System definition
- Requirements collection and analysis
- Database design
- DBMS selection (optional)
- Application design
- Prototyping (optional)
- Implementation
- Data conversion and loading
- Testing
- Operational maintenance.

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Week 5ᵗʰ Topics

	Database planning (Section 9.3)
	System definition (Section 9.4)
	Requirements collection and analysis (Section 9.5)

Database design (Section 9.6)
- Conceptual database design
- Logical database design
- Physical database design

DBMS selection (optional) (Section 9.7)

Application design (Section 9.8)

Prototyping (optional) (Section 9.9)

Implementation (Section 9.10)

Data conversion and loading (Section 9.11)

Testing (Section 9.12)

Operational maintenance (Section 9.13)

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Week 5ᵗʰ Topics

Database Planning

➢Performed at the top level and must be integrated with overall IS strategy of the organization

➢Mission statement for the database project defines major aims and clarify purpose of the database project and provides clearer path towards the efficient and effective creation of required database application

➢May be accompanied by some additional information that specifies the work to be done, the resources with which to do it, and the money to pay for it all

➢Database planning should also include development of standards that govern:

  ▪how data will be collected,

  ▪how the format should be specified,

  ▪what necessary documentation will be needed,

  ▪how design and implementation should proceed.

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System Definition

- Describes scope and boundaries of database application and the major user views

- Database application may have one or more user views.

- Identifying user views helps ensure that no major users views of the database are forgotten when developing requirements for new application.

- User views also help in development of complex database application allowing requirements to be broken down into manageable pieces

- Present needs and future needs

Requirements Collection and Analysis

The most critical step also called **problem identification** i.e. to find out the problems and their reasons

Process of collecting and analyzing information about the part of organization to be supported by the database application, and using this information to identify users' requirements of new system

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Requirements Collection and Analysis

Information is gathered for each major user view including:

  ✓a description of data used or generated;

  ✓details of how data is to be used/generated;

  ✓any additional requirements for new database application.

Information is analyzed to identify requirements to be included in new database application

Reasons

▪The current system is difficult to use

▪Current system don't work accordingly

▪Current system producing inaccurate results

▪Current system needs improvements

Role of System Analyst

▪Begins a preliminary investigation to find out the problems and its sources

▪Prepares and submit a report to organization

▪Request for approval of project

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Role of System Analyst

▪The report contains the following

▪Problem definitions

▪Cost for their solutions

▪Time duration

▪Staff required

▪Hardware and software technologies

Analysis

After project approval system analyst investigate the system in detail by using the following analysis techniques

▪Review of Physical Records

▪Interviews

▪Questionnaire

▪Observation

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Database Design

Process of creating or designing a database that will support the enterprise's operations and objectives

Major aims:

➢Represent data and relationships between data required by all major application areas and user groups.

➢Provide data model that supports any transactions required on the data.

➢Specify a minimal design that is appropriately structured to achieve stated performance requirements for the system (such as response times).

Three phases of database design:

▪Conceptual database design

▪Logical database design

▪Physical database design

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1. **Conceptual Database Design**

▪Process of constructing a model of the information used in an enterprise, independent of *all* physical considerations.

▪Data model is built using the information in users' requirements specification.

▪Source of information for logical design phase

2. Logical Design

▪Conceptual data model is refined and mapped on to a logical data model.

▪Means different algorithms, flowcharts are designed e.g. DFD, ERD

▪ Logical design provides a clear understanding and roadmap about the proposed system

3. Physical Design

▪Process of producing a description of the database implementation on secondary storage.

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3. Physical Design

▪Describes storage structures and access methods used to achieve efficient access to data.

▪Tailored to a specific DBMS system

DBMS Selection

▪Selection of an appropriate DBMS to support the database application.

▪Undertaken at any time prior to logical design provided sufficient information is available regarding system requirements.

▪Main steps to selecting a DBMS:

> ➢define Terms of Reference of study;

> ➢shortlist two or three products;

> ➢evaluate products;

> ➢recommend selection and produce report

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Data definition	Physical definition
Primary key enforcement	File structures available
Foreign key specification	File structure maintenance
Data types available	Ease of reorganization
Data type extensibility	Indexing
Domain specification	Variable length fields/records
Ease of restructuring	Data compression
Integrity controls	Encryption routines
View mechanism	Memory requirements
Data dictionary	Storage requirements
Data independence	
Underlying data model	
Schema evolution	

Accessibility	Transaction handling
Query language: SQL2/SQL3 ODMG compliant	Backup and recovery routines
	Checkpointing facility
Interfacing to 3GLs	Logging facility
Multi-user	Granularity of concurrency
Security	Deadlock resolution strategy
– Access controls	Advanced transaction models
– Authorization mechanism	Parallel query processing

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Application Design

Design of user interface and application programs that use and process the database.

Database and application design are parallel activities.

Includes two important activities:

- transaction design;

- user interface design.

Transactions

- An action, or series of actions, carried out by a single user or application program, which accesses or changes content of the database

- Important characteristics of transactions:

  - data to be used by the transaction;

  - functional characteristics of the transaction;

  - output of the transaction;

  - importance to the users;

  - expected rate of usage.

- Three main types of transactions: retrieval, update, and mixed.

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Prototyping (Optional)

Building working model of a database application.

Purpose

- to identify features of a system that work well, or are inadequate;

- to suggest improvements or even new features;

- to clarify the users' requirements;

- to evaluate feasibility of a particular system design.

Implementation

Physical realization of the database and application designs.

- ✓Use DDL to create database schemas and empty database files.

- ✓Use DDL to create any specified user views.

- ✓Use 3GL or 4GL to create the application programs. This will include the database transactions implemented using the DML, possibly embedded in a host programming language.

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Data Conversion and Loading

▪Transferring any existing data into new database and converting any existing applications to run on new database.

▪Only required when new database system is replacing an old system.

     DBMS normally has utility that loads existing files into new database.

▪May be possible to convert and use application programs from old system for use by new system

Testing

▪Process of executing application programs with intent of finding errors.

▪Use carefully planned test strategies and realistic data.

▪Testing cannot show absence of faults; it can show only that software faults are present.

▪Demonstrates that database and application programs *appear* to be working according to requirements

▪Two types of testing are: unit and integrated

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Operational Maintenance

▪Process of monitoring and maintaining system following installation.

▪Monitoring performance of system.

➤if performance falls, may require tuning or reorganization of the database.

▪Maintaining and upgrading database application (when required).

▪Incorporating new requirements into database application.

Feed Back

Request can be send back to planning stage to solve the problems and improve the system accordingly