Database Management: Concepts and Design

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Database System : Concepts and Design

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Synopsis:

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1. Introduction to Database :

An organization must have accurate and reliable data for effective decision making. To this end, the organization maintains records on the various facets maintaining relationships among them. Such related data are called a **database**. A **database system** is an integrated collection of related files, along with details of the interpretation of the data contained therein. Basically, database system is nothing more than a computer-based record keeping system i.e. a system whose overall purpose is to record and maintain information/data.

A **database management system (DBMS)** is a software system that allows access to data contained in a database. The objective of the DBMS is to provide a convenient and effective method of defining, storing and retrieving the information contained in the database. The DBMS interfaces with the application programs, so that the data contained in the database can be used by multiple applications and users. In addition, the DBMS exerts centralized control of the database, prevents fraudulent or unauthorized users from accessing the data, and ensures the privacy of the data.

Generally a database is an organized collection of related information. The organized information or database serves as a base from which desired information can be retrieved or decision made by further recognizing or processing the data. People use several databases in their day-to-day life. Dictionary, Telephone directory, Library catalog, etc are example for databases where the entries are arranged according to alphabetical or classified order.

The term **'DATA'** can be defined as the value of an attribute of an entity. Any collection of related data items of entities having the same attributes may be referred to as a **'DATABASE'**. Mere collection of data does not make it a database; the way it is organized for effective and efficient use makes it a database.

Database technology has been described as "one of the most rapidly growing areas of computer and information science". It is emerged in the late Sixties as a result of combination of various circumstances. There was a growing demand among users for more information to be provided by the computer relating to the day-to-day running of the organization as well as information for planning and control purposes. The technology that emerged to process data of various kinds is grossly termed as **'DATABASE MANAGEMENT TECHNOLOGY'** and the resulting software are known as **'DATABASE MANAGEMENT SYSTEM' (DBMS)** which they manage a computer stored database or collection of data.

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1.1 Meaning and Definition of Database :

An **entity** may be concrete as person or book, or it may be abstract such as a loan or a holiday or a concept. Entities are the basic units of objects which can have concrete existence or constitute ideas or concepts. An entity set is a set of entities of the same type that share the same properties or attributes .

An entity is represented by set of **attributes**. An attribute is also referred as *data item, data element , data field,* etc. Attributes are descriptive properties possessed by each member of an entity set. A groping of related entities becomes an **entity set**.

For ex : In a library environment,

Entity Set -Catalogue -

Entity -of Books, Journals, AV-Materials, etc

Attributes - contains Author, Title, Imprint, Accn. No., ISBN, etc.

The word **'DATA'** means a fact or more specially a value of attribute of an entity. An entity in general, may be an object, idea, event, condition or situation. A set of attributes describes an entity. Information in a form which can be processed by a raw computer is called data. Data are raw material of information.

The term **'BASE'** means the support, foundation or key ingredient of anything. Therefore base supports data.

A '**DATABASE'** can be conceived as a system whose base, whose key concept, is simply a particular way of handling data. In other words, a database is nothing more than a computer-based record keeping. The objective of database is to record and maintain information. The primary function of the database is the service and support of information system which satisfies cost.

In short, " A database is an organized collection of related information stored with minimum redundancy, in a manner that makes them accessible for multiple application".

Definition :

1. Prakash Naveen : "Database is a mechanized shared formally defined and central collection of data used in an organization".

2. J.M.Martin : " Database is a collection of inter-related data stored together without harmful or unnecessary redundancy to serve multiple application".

3. Mac-Millan dictionary of Information Technology : defines a database as a " a collection of inter-related data stored so that it may be accessed by authorized users with simple user-friendly dialogues".

1.2 Functions of Database :

The general theme behind a database, is to handle information as an integrated whole. The general objective is to make information access easy, quick, inexpensive and flexible for the user.

- **Controlled redundancy :** Redundant data occupies space and therefore is wasteful. By controlled redundancy, system performance is improved.
- **User-friendly** (i.e. ease to learning and use) **:** A major feature of a user-friendly database package is how easy it is to learn and use.

- **Data independence :** means it allows for changes at one level of the database without affecting the other levels i.e. changing hardware and storage procedures or adding new data without having to rewrite application program.
- **Economy** (i.e. more information at low cost) **:** Using, storing and modifying data at low cost are important.
- **Accuracy and integrity :** Even if redundancy is eliminated, however, the database may still contain incorrect data. Centralized control of the database helps in avoiding these situation. The accuracy of a database ensures that data quality and content remain constant. Integrity controls detect data inaccuracies where they occur.
- **Recovery from failure :** With multi-user access to a database, the system must recover quickly after it is down with no loss of transactions. It helps to maintain data accuracy and integrity.
- **Privacy and Security :** For data to remain private, security measures must be taken to prevent unauthorized access i.e. complete jurisdiction over the operational data. DBMS ensures proper security through centralized control.
- **Performance :** It emphasizes response time to inquiries suitable to the use of the data depends on the nature the user-database dialogue.
- **Database retrieval, analysis, storage :**.It facilitates Database retrieval, analysis and storage.
- **Compatibility :** Usefulness i.e. hardware/software can work with different computers.
- **Concurrency control :** is a feature that allows simultaneous access to a database, while preserving data integrity.
- **Support :** Support of complex file structure and access path. Ex : MARC
- **Data Sharing :** A database allows sharing of data under its control by any number of users.
- **Standards can be enforced :** Standardizing stored data formats is particularly desirable as an aid to *data interchange* between systems.

1.3 Types of Databases :

Database is considered as a central pool of data which can be shared by a community of users. There are three yard sticks to determine the nature of data we can deal with. They are :

a. Whether data is free of format or whether it is formatted.
b. Whether definition of data is of the same size as data itself.
c. Whether the data is active or passive.

Whether these yard sticks are applied to data. We can classify database into four kinds which are

1.3.1 Bibliographic Databases
1.3.2 Knowledge Databases
1.3.3 Graphic-Oriented Databases
1.3.4 Decision-making Databases

1.3.1 Bibliographic Databases : have data which is free of format (unformatted data). They are composed of textual data which, by it's very nature, displays little or no format. Such databases are often used in Library and information system. Here data could be composed of abstracts of books and such documents with key words and key phrases. Through the abstract, one can determine the document is of interest or not. Bibliographic database contains descriptive information about documents, titles, authors, Journal name, Volume and Number, date, keywords, abstract, etc.

1.3.2 Knowledge Databases : are used in Artificial Intelligence applications. The data contained in these is discrete and formatted. In these there are typically many kinds of data, with only a very few occurrence of each kind. Such databases having the size of the data is as large as the definition of the data.

1.3.3 Graphic-Oriented Databases : could possibly used in Computer-Aided Design (CAD). The data in such database is characterized as being active. This means that data is a procedure capable of being executed. Any modification can be made in data, as the above 1 and 2 cannot be executed in a computer.

Ex : Computer-Aided Design (CAD)
Computer-Aided Learning (CAL)
Computer-Aided Instruction (CAI)

1.3.4 Decision-making Databases : are used in corporate management and allied administrative tasks. Using data contained in these databases, one could handle problem like resource planning and sales forecasting. These databases are characterized by the fact and their data contents are :

a. Formatted
b. Far longer than description
c. Passive

These Decision-making databases are often referred to as just databases. Depending upon the kind of databases being handled Database Management Systems (DBMS) can be classified as for example : Bibliographic Database Management Systems, Knowledge Database Management Systems and so on.

1.4 Concept of Data Structure :

Data are structured according to the Data model. A group of data elements handled as a unit. Ex : Book details - is a data structure consisting of the data elements - Author name, Title, Publisher's name, ISBN and Quantity.

There are several different approaches to analyzing the logical structure of data in complex databases. Although all DBMS's have a common approach to data management, they differ in the way : the structure of data.

There are three types of data structure, viz

1.4.1 List Structure
1.4.2 Tree / Hierarchical Structure
1.4.3 Network Structure

1.4.1 List Structure : A list is nothing morethan a special data structure made up of data record where the Nth record is related (N-1) and (N-2) simply because of positioning. This brings **one-to-one** relationship. This structure is illustrated as below :

Fig. Simple List Structure

1.4.2 Tree / Hierarchical Structure : A tree structure is a non-linear multilevel hierarchical structure in which each node may be related to N-nodes at any level below it. But to only one node above it in the hierarchy.

The entry is from the top and the direction of search or passing is downward and no branches on the tree trunk (touch).

Data storage in the form of a parent-child relationship. The origin of a data tree is the **root**. Data located at different levels along a particular branch from the root is called the **node**. The last node in the series is called the **leaf**. Each child has pointers to numerous siblings and there is just one pointer to the parent thus resulting in a **one-to-many** relationship.

Fig. Tree / Hierarchical Structure

1.4.3 Network Structure : Network Structure is another form of hierarchical structure. In this view as in the hierarchy approach, the data is represented by records and links. However, a network is a more general structure than a hierarchy.

A network structure allows relationships among entities. Here user views the database as a number of individual record occurrences in which a given node may have any number of subordinates nodes. Network Structure is equated to a graph structure. This brings **many-to-many** relationship. The relationship between the different item is called as **sets**.

Fig. Network Structure

2. Introduction to Database Management System (DBMS) :

A DBMS is essentially a collection of interrelated data and a set of programs to access this data. This collection of data is called the **Database** which facilitates storage, retrieval and management of information.

A DBMS consists of a collection of interrelated data and a set of programs to access those data. The collection of data, usually referred to as the **database.** The primary goal of DBMS is to provide an environment that is both convenient and efficient to use in retrieving and storing database information.

Database systems are designed to manage large bodies of information. The management of data involves both the definition of structures for the storage of information and the provision of mechanisms for the manipulation of information.

In addition, the database system must provide for the safety of the information stored, despite system crashes or attempts at unauthorized access. If data are to be shared among several users, the system must avoid possible anomalous results.

DBMS is a software system which manages the databases providing facilities for organization access and control. DBMS is like an operator for database. Database is passive where as DBMS is active one. It provides the interface between the data file on disk and the program that requests processing.

2.1 Objectives of DBMS :

The primary objective of a DBMS is to provide a convenient environment to retrieve and store database information. It support single-user and multi-user environment.

- Provide for mass storage of relevant data.
- Make access to the data easy for user.
- Provide prompt response to user requests for data.
- Make the latest modifications to the database available immediately.
- Eliminate the redundant data.
- Allow multiple users to be active at one time.
- Allow for growth in the database system.
- Protect the data from physical harm and unauthorized access.
- Control over data correctness, consistency, integrity, security, etc.

2.2 Functions of DBMS :

According to the Codd, a comprehensive DBMS provides eight major functions. viz

- **Data storage, retrieval and update :** A database may be shared by many users thus, the DBMS must provide multiple users views and allow users to store, retrieve and update easily and effectively.
- **Data dictionary and directory :** The DBMS must maintain a user accessible data dictionary.
- **Transaction integrity :** A transaction is sequence of steps that constitute some well defined business activity. To maintain transaction integrity, the DBMS must provide facilities for the user or application program to define transaction boundaries i.e. the logical beginning and end of transactions. The DBMS should then commit changes for successful transactions and reject changes for aborted transactions.
- **Recovery Services :** The DBMS must be able to restore the database in the events of some system failure. Sources of system failure include operator error, disk head crashes and program errors.
- **Concurrency Control :** Since a database is a shared by multiple users, two or more users may attempt to access the same data simultaneously. If two users attempt to update the same data record concurrently, erroneous results may occur. Since the safeguards must be built into the DBMS to prevent or overcome the efforts of interference.
- **Security mechanisms :** Data must be protected against accidental or intentional misuse or distraction. The DBMS provides mechanisms for controlling access to data and for defining what action may be taken by each user.
- **Data Communication interface :** Users often access a database by means of remote terminates in telecommunication network. A telecommunication monitor is used process the flow of transactions to and from the remote terminates. The DBMS must provide a interface with one or more telecommunication monitors so that all the necessary functions are performed and the system will assist, rather than a burden on the end user.
- **Integrity services:** The DBMS must provide facilities that assist users in manufacturing the integrity of their data. A variety of edit checks and integrity constraints can be designed into the DBMS and its software interfaces. These checks are normally administered through the data dictionary.

2.3 Components of a DBMS :

A DBMS is a complex structure that is used to manage, store and manipulate data and the metadata used to describe the data. It is utilized by a large variety of users to retrieve and manipulate data under its control. A system is a composed of set of interrelated components.

1. Atleast one person who owns and is responsible for the database.
2. A set of rules and relationship that defines and governs the interactions among elements of the database.

3. People who put data into the database.
4. People who get data out of the database.
5. The database itself.

3. Database Design :

Database design is the design of the database structure that will be used to store and manage data rather than the design of the DBMS software. Once the database design is completed, the DBMS handles all the complicated activities required to translate the designer's view of the structures into structures that are usable to the computer.

A poorly designed database tends to generate errors that are likely to lead to bad decisions. A bad database design eventually can be self correcting: organizations using poorly designed databases often fail because their managers do not have access to timely (or even correct) information, thereby dominating the bad database design.

The availability of a DBMS makes it possible to tackle far more sophisticated uses of the data resources, if the database is designed to make use of that available power. The kinds of data structures created within the database and the extent of the relationships among them play a powerful role in determining how effective the DBMS is. Therefore, database design become a crucial activity in the database environment.

Database design is made much simpler when we use **models.** A Database model is a collection of a logical constructs used to represent the data structure and the data relationships found within the database i.e. simplified abstractions of real-world events or conditions. If the models are not logically sound, the database designs derived from them will not deliver the database system's promise to effective information drawn from an efficient database. "*Good models yield good database design that are the basis for good applications*".

3.1 Goals of Database Design :

Database Design normally involves defining the logical attributes of the database designing the layout of the database file structure.

The main objectives of database design is

1. To satisfy the information content requirement of the specified user and application.
2. To provide a natural and easy way to understand structuring of the information.
3. To support processing requirements and any performance objectives such as
    i. Response time
    ii. Processing time
    iii. Storage space

The main objective of the database design is to ensure that the database meets the reporting and information requirements of the users efficiently. The database should be designed in such a way that :

i. It eliminates or minimizes data redundancy.
ii. Maintains the integrity and independence of the data.

3.2 Logical and Physical View of Database :

Computer	Application Program	DBMS	Operating System (IOCS)*	Database

User logical View	Program logical View	Overall logical View (Schema)	Physical View
1	2	3	4

* IOCS- Input/ Output Control System

In database design, several views of data must be considered along with the persons who use them. There are three views :

1. The overall logical view
2. The program logical view
3. Physical view

The logical view is what the data look like, regardless of how they are stored whereas the
physical view is the way data exist in physical storage, it deals with how data are stored, accessed or related to other data in storage.
Four views of data : THREE logical views and ONE physical view.

The logical view as the user's view, the programmer's view and the overall logical view (schema).

The overall logical view (schema) helps the DBMS to decide what data in storage it should act upon as required by the application program.

A DBMS is a collection of interrelated files and a set of programs that allow users to access and modify these files. A major purpose of a database system is to provide users with an **abstract view** of the data i.e. the system hides certain details of how the data are stored and maintained.

3.3 An Architecture for a Database System :

3.3.1 Data Abstraction : Many database system users are not computer trained, developers hide the complexity from users through several level of abstraction, to simplify users' interaction with the system. The architecture is divided into three general levels : internal, conceptual and external.

a. Internal / Physical level : The internal level is the one closest to physical storage i.e. one concerned with the way in which the data is actually stored. It is the lowest level of abstraction describes *how* the data are actually stored. At the physical level, complex low level data structures are described in detail.

b. Conceptual / Logical level : is a "level of indirection" between the internal and external. The next higher level of abstraction describes *what* data are stored in the database, and what relationships exists among those data. The entire database is thus described in term of a small number of relatively simple structures. This level is used by Database Administrators(DBA), who must decide what information is to be kept in the database.

c. External / View level : The external level is the one closest to the users, i.e. the one concerned with the way in which the data is viewed by individual users. It is the highest level of abstraction describes only part of the entire database. Despite the use of simpler structures at the logical level, some complexity remains, because of the large size of the database. Many users of the database system will not be concerned with all this information. Instead, such users need to access only a part of the database so that their interaction with the system is simplified, the view level of abstraction is defined. The system may provide many views for the same database.

If the external level is concerned with the *individual* user views, the conceptual level may be thought of as defining a *community* user view. In other words, there will be many "external views," each consisting of a more or less abstract representation of some portion of the database, and there will be a single "conceptual view," consisting of a similarity abstract representation of the database in its entirety. Likewise, there will be a single "internal view," representing the total database as actually stored.

Fig. The three levels of architecture of a DBMS

3.3.2 Instances and schemes : Databases change over time as information is inserted or deleted. The collection of information stored in the database at a particular moment is called an **instance** of the database. The overall design of the database is called the database **schema.** Schemas are changed infrequently, if at all.

The view at each of these levels is described by a **Schema**. A schema is an outline or a plan that describes the records and relationships existing in the view. The word schema is used in the database literature for the plural instead of schemata, the grammatically correct word. The schema also describes the way in which entities at one level of abstraction can be mapped to the next level.

Database systems have several schemas, partitioned according to the levels of abstraction(that we discussed). At the lowest level is the **physical schema**; at the intermediate level is the **logical schema**; and at the highest level is a **subschema**. In general, database system support one physical schema, one logical schema and several subschemas.

3.3.3 Data independence : The ability to modify a schema definition in one level without affecting a schema definition in the next higher level is called **data independence.** There are two levels of data independence viz.

a. Physical data independence : is the ability to modify the physical schema without causing application programs to be rewritten. Modifications at the physical level are occasionally necessary to improve performance.

b. Logical data independence : is the ability to modify the logical schema without causing application programs to be rewritten. Modifications at the logical level are occasionally necessary whenever the logical structure of the database is altered.

Logical data independence is more difficult to achieve than is physical data independence, since the application programs are heavily dependent on the logical structure of the data that they access.

3.3.4 Database languages : Data Sublanguage (DSL) is a subset of the total language i.e. concerned with the database objects and operations. DSL is a user's / query language which is being embedded in a host language. In principle, any given DSL is really combination of two languages :

a. Data Definition Language (DDL) : is one which specify the database schema. A database schema is specified by a set of definitions. This definition includes all the entities and their associated attributes as well as the relationships among the entities. The result of compilation of DDL statements is a set of tables i.e. stored in a special file called **data dictionary** or **data directory,** which caontains *metadata* i.e. data about data. This file is consulted before actual data are read or modified in the database system.

The storage structure and access methods used by the database system are specified by a set of definitions in a special type of DDL called a *data storage and definition language.*

b. Data Manipulation Language (DML) : is one which is used to express data queries and updates i.e. manipulate data in the database. DML helps in

- the retrieval of information stored in the database
- the insertion of new information into the database
- the deletion of information from the database
- the modification of information stored in the existing database

A DML is a language that enables users to access or manipulate data as organized by the appropriate data model. There are basically two types :

i. Procedural DMLs : requires a user to specify *what* data are needed and *how* to get those data.

ii.Non- Procedural DMLs : requires a user to specify *what* data are needed *without* specifying *how* to get those data.

Mapping : There are two levels of mapping :

i. one between the external and conceptual levels of the system; and

ii. the other between the conceptual and internal levels.

The **Conceptual/Internal mapping** defines the correspondence between the conceptual view and the stored database. The **External/Conceptual mapping** defines the correspondence between a particular external view and the conceptual view.

Fig. Database System Architecture

The DBMS is the software that handles all access to the database. Conceptually what happens is the following :

1. A user issues an access request, using some particular Data Manipulation Language(DML);

2. the DBMS intercepts the requests and interprets it;

3. the DBMS inspects, in turn the external schema, the external/conceptual mapping, the conceptual schema, the conceptual/internal mapping, and the storage structure definition; and
4. the DBMS performs the necessary operations on the stored database.

3.4 Storage Structures :

Storage Structures describes the way in which data may be organized in secondary storage i.e. direct access media such as disk packs, drums and so on.

Fig : The Stored record interface

User operations are expressed (via the DML) in terms of external records, and must be converted by the DBMS into corresponding operations on internal or stored records. These later operations must be converted in turn to operations at the actual hardware level, i.e. to operations on physical record or blocks. The component responsible for this internal/physical conversion is called an **access method**. Its function is to conceal all device-dependent details from the DBMS and to present the DBMS with a **stored record interface**. The stored interface thus corresponds to the internal level, just as the user interface corresponds to the external level. The Physical record interface corresponds to the actual hardware level.

The stored record interface permits the DBMS to view the storage structure as a collection of stored files, each one consisting of all occurrences of one type of stored record(see architecture of DBMS).Specifically, the DBMS knows (a). what stored files exist, and, for each one, (b) the structure of the corresponding stored record, (c) the stored field(s), if any, on which it is sequenced, and (d) the stored field(s), if any, that can be used as search arguments for direct access. This information will all be specified as part of the storage structure definition.

3.5 Phases in Database Design :

3.5.1 First phase : The overall purpose of the database initial study is to

a. analyze the organization/system situation
b. define problem and constraints
c. define objectives
d. define scope and boundaries.

3.5.2 Second phase : The second phase focuses on the design of the database model that will support organization operations and objectives.

In this phase, we can identify six main phases of the database design :

I. Requirements collection and analysis
II. Conceptual database design
III. Choice of DBMS
IV. Data model mapping
V. Physical database design
VI. Database system implement

Fig : Procedure flow in database design

I. Conceptual Design : It involves two parallel activities

a. Conceptual scheme design

b. Transaction design

a. The first activity of Conceptual design examines the data requirements resulting from Phase 1 and produces a Conceptual database scheme.

b. The second activity Transaction design examines the database applications analyzed in Phase 1 and produces high-level specifications for the presentation. The goal of Phase 2 is to produce a Conceptual schema for the database i.e. independent of a specific DBMS.

In this stage, data modeling is used to create an abstract database structure that represents real world objects in the most realistic way possible. The conceptual model must embody a clear understanding of the transaction or system and its functioning areas. This design is software and hardware independent.

i. Data Analysis and Requirements : Before we can effectively design a database, we must know the expectations of the users and the intended users of the database as much detail as possible. The process of identifying and analyzing the intended users is called " Requirements collection and analysis".

It is the first step in Conceptual design is to discover the data element characteristics. Appropriate data element characteristics are those that can be performed into appropriate information. Therefore designers has to focussed on :

a. information needs;

b. information users ;

c. information sources; and

d. information constitution.

In order to develop an accurate data model, the designer must have a thorough and complete understanding of the organization's data. Consequently, the designer must identify the organization's goals and objectives, rules and analyze their impact on the nature, role and scope of data.

ii. Entity-Relationship modeling and normalization : Before creating the E-R model(data model) the designer must communicate and enforce appropriate standards to be used in the documentation of the design. Failure to standardize documentation often means a failure to communicate later. And communication failures often leads to poor design work.

iii. Data model verification : The E-R model must be verified against that the proposed system processes in order to corroborate that the intended processes can be supported by the database model.

Verification requires that the model can be run through a series of test against :

a. End user data views and their required transactions : SELECT, INSERT, UPDATE and DELETE operations and queries and reports.

b. Access paths, security and concurrency control.

c. System / Business-imposed data requirements and constraints.

iv. Distributed Database Design : A distributed database stores logically related data into two or more physically independent sites connected via a computer network. Design portions of a database may reside in different locations. Processes that access the database may also vary from one location to another.

II. DBMS Software selection : The selection of DBMS software is critical to the information systems' smooth operation. Consequently, the proposed DBMS software's advantages and disadvantages should be carefully studied. The end user must be made aware of the limitations of both the DBMS and the database in order to avoid false expectations.

Factors affecting the purchasing decision of DBMS are :
(i).Cost, (ii). DBMS features and tools, (iii). Underlying data model, (iv). Portability, and (v). DBMS hardware requirements.

III. Logical Design : Logical design is used to translate the Conceptual design into the internal model for a selected DBMS (such as DB2, SQL Server, Oracle, IMS, Informix, Access, Ingress and so on). Logical Design follows the decision to use a specific database model (hierarchical, network or relational). Once the database model is identified, we can map the Conceptual design onto a Logical design that is tailored to the selected database model. At this stage, the logical design is Software dependent. This includes mapping all objects in the model to the specific constructs used by the selected database software. The right to use the database is also specified during the logical design phase.

In short, the logical design translates the software independent conceptual model into a software dependent model by defining the appropriate domain definitions, the required tables and the necessary access restrictions.

IV. Physical Design : The stage is now set to define the physical requirements that allow the system to function within the selected hardware environment.

Physical design is the process of selecting the data storage and data access characteristics of the database. The storage characteristics are a function of the types of devices supported by the hardware, the type of the data access methods supported by the system and the DBMS. Physical design affects not only the location of the data in the storage device(s) but also the performance of the system.

V. Database system implement : After the database has been created, the data must be loaded into the database tables. If the data are currently stored in a format different from the required by the new DBMS, the data must be converted prior to being loaded.

During the implementation and loading phase, we also must address performance, security, backup and recovery, integrity, company standards and concurrency control.

4. Application of DBMS to Library and Information System :

There are two software packages related to Library and Information System. viz.

4.1 DBase III Plus : is one of the most popular DBMS on personal computers. It is the third major version of the classic dBase database management system series from Ashton Tate. It is powerful and flexible system for storing, organizing, analyzing and

retrieving information on a microcomputer. It can be interacted by two modes: one is the *assistant/menu mode* and other is the *command mode.*

4.2 CDS/ISIS : is menu driven generalized information storage and retrieval system designed specially for the computerized management of structured non-numerical databases. It contains 8 programs written in PASCAL language. In India, it is distributed by the National Information System for Science and Technology (NISSAT), Department of Scientific and Industrial Research, New Delhi on behalf of UNESCO.

5. Conclusion :

The field of information technology is growing out in a very fats rate in India. Recently, new types requirements in database processing capabilities have been increasing in several area of application. At the same time, a variety of sophisticated techniques have been developed and powerful modeling capabilities.

Database development process includes information gathering, selection of quality information, computation and consolidation or abstracting in case of bibliographic database, coding, structuring the compiled data into database format, data entry and editing, updating, quality control at all levels and maintenance.

As such database expresses a concept which has evolved and change gradually over the years since the term was coined. Implementation of the concept has made possible by improving hardware and software technology as made available increasingly regarded as a vital corporate resource.

India is a large country with vast natural resources. Still the information is scarce. It is not that information is not generated but gets locked on papers to be put in files in the custody of various government organizations and research institutions. India needs database in view of liberalization of Indian economy and the globalization of business. The increasing international interaction requires formation of relevant and viable database.

In addition to the database with in an organization a vast new demand is growing for database services. It has developed tremendously over the time to support the changing world's need control and communication philosophies within the organizations as well as outside as seen by the users of this service.

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