



# History of Database Systems

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By  
Kaushalya Dharmarathna(030087)  
Sandun Weerasinghe(040417)



## Early Manual System

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- Before-1950s
  - Data was stored as paper records.
  - Lot of man power involved.
  - Lot of time was wasted.  
e.g. when searching
  - Therefore inefficient.



## Revolution began

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- 1950s and early 1960s:
  - Data processing using magnetic tapes for storage
  - Tapes provide only sequential access
  - Punched cards for input
- Late 1960s and 1970s:
  - Hard disks allow direct access to data
  - Data stored in files
  - Known as File Processing System



## File based systems

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- Adequate for small applications
- **Drawbacks**
  - Separation and isolation of data
    - Each program maintains its own set of data.
    - Users of one program may be unaware of potentially useful data held by other programs.



## File based systems (contd.)

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- Duplication of data
  - Same data is held by different locations.
  - Wasted space and potentially different values and/or different formats for the same item.
- Data dependence
  - File structure is defined in the program code.



## File based systems (contd.)

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- Incompatible file formats
  - Programs are written in different languages, and so cannot easily access each other's files.
- Fixed Queries/Proliferation of application programs
  - Programs are written to satisfy particular functions.
  - Any new requirement needs a new program.

## Database Approach

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- Arose because:
  - Definition of data was embedded in application programs, rather than being stored separately and independently.
  - No control over access and manipulation of data beyond that imposed by application programs.
- Result:
  - The database and Database Management System (**DBMS**).

## Database Management Systems (DBMS)

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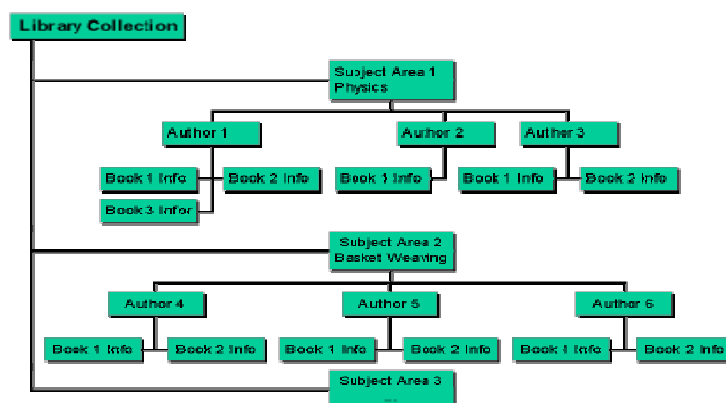
1960's	Hierarchical	Network		
1970's	Relational			
1990's	Object-oriented	Object-relational		
1995+	Java	XML	CMDB	Mobile
	IMDB	Embedded		

## Hierarchical Model

- Well suited for data which are in some way related
- Hierarchically begin with a strictly defined tree of data nodes
- Each node can contain some identifying data, plus a set of subnodes of a specific child type

## Hierarchical Model (Contd.)

### Hypothetical Hierarchical Database Model



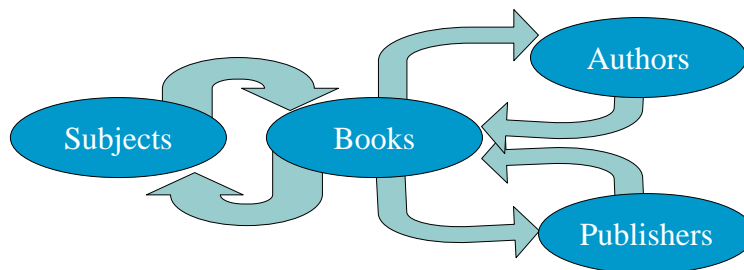
## Network Model

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- Supported more complex relations
- Physical file pointers were used to model the relations between files
- Relations had to be decided in advance
- Most suitable for large databases with well defined queries and well-defined applications.

## Network Model (Contd.)

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## Relational Model (1970's)

- **E.F. Codd** introduced the relational model in 1970
- Provides a conceptually simple model for data as relations (typically considered "tables") with all data visible.
- DB2 from IBM is the first DBMS product based on the relational model

## Relational Model (Contd.)

PubID	Publisher	PubAddress
03-4472822	Random House	123 4th Stree, New York
04-7733903	Wiley and Sons	45 Lincoln Blvd, Chicago
03-4859223	O'Reilly Press	77 Boston Ave, Cambridge
03-3920886	City Lights Books	99 Market, San Francisco

AuthorID	AuthorName	AuthorBDay
345-28-2938	Haile Selassie	14-Aug-92
392-48-9965	Joe Blow	14-Mar-15
454-22-4012	Sally Hemmings	12-Sep-70
663-59-1254	Hannah Arendt	12-Mar-06

ISBN	AuthorID	PubID	Date	Title
1-34532-482-1	345-28-2938	03-4472822	1990	Cold Fusion for Dummies
1-38482-995-1	392-48-9965	04-7733903	1985	Macrame and Straw Tying
2-35921-499-4	454-22-4012	03-4859223	1852	Fluid Dynamics of Aquaducts
1-38278-293-4	663-59-1254	03-3920886	1967	Beads, Baskets & Revolution



## Relational Model (Contd.)

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- Other DBMS based on the relational model were developed in the late 1980s
- Today, DB2, Oracle, and SQL Server are the most prominent commercial DBMS products based on the relational model



## Object Oriented Data Model (1990's)

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- Goal of OODBMS is to store object-oriented programming objects in a database without having to transform them into relational format.
- Extend the entity-relationship data model by including encapsulation, methods and object identity





## Object-relational models

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- Extend the relational data model by including object orientation and constructs to deal with added data types.
- Allow attributes of tuples to have complex types, including non-atomic values such as nested relations.
- Preserve relational foundations, in particular the declarative access to data, while extending modeling power.



## Modern Database Management Systems

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- DBMS are large complex pieces of software designed specifically for the efficient management of data.
- Examples:
  - Oracle (Oracle Corporation)
  - Ingres (Computer Associates)
  - SQL Server (Microsoft Corporation)
  - Access (Microsoft Corporation)
  - IMS, DB2 (IBM)
  - And many more...