

Unit 1: Database Systems

(Part 1)

Outline

- Introduction
- The difference between data and information
- What is a database?
- Database Management Systems
- Types of databases
- Database design

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Question

What is a Database?

Question

Mention examples of databases
you know.

Question

Why do we need Databases?

FIGURE 1.1 THE PERVASIVE NATURE OF DATABASES

A Day In Susan's Life

See how many databases she interacts with each day

*Before leaving for work,
Susan checks her
Facebook and
Twitter accounts*



Where is the data about the
friends and groups stored?

Where are the "likes" stored
and what would they be
used for?



*On her lunch break,
she picks up her
prescription at the
pharmacy*



Where is the pharmacy
inventory data stored?

What data about each
product will be in the
inventory data?

What data is kept about
each customer and where
is it stored?



*After work, Susan
goes to the grocery
store*



Where is the product
data stored?

Is the product quantity in
stock updated at checkout?

Does she pay with a credit
card?



*At night, she plans for a trip
and buys airline tickets and
hotel reservations online*



Where does the online
travel website get the
airline and hotel data from?

What customer data would
be kept by the website?

Where would the customer
data be stored?



*Then she makes a few
online purchases*



Where are the product
and stock data stored?

Where does the system get
the data to generate product
"recommendations" to the
customer?

Where would credit card
information be stored?



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Data and Databases are
everywhere!

Question

Is data the same as information ?

YES or NO

Question

What is the difference between
data and **information**?

Data versus Information

Data

- Raw facts
 - Have not yet been processed to reveal their meaning to the end user
- Building blocks of information

Information

- Produced by processing raw data to reveal its meaning
- Requires context
- Bedrock of **knowledge**
- Should be accurate, relevant, and timely to enable good decision making

FIGURE 1.2 TRANSFORMING RAW DATA INTO INFORMATION

a) Data entry screen

Middle Tennessee State University

You are viewing the College console.

Select Member

Home | Faculty | Activity Aggregators | Seminars | Publications | Review & Accreditation | Messages | Builders & Tools | Calendar | Directory | Links | Settings | Home | Sign Out

Jimmie A. Jones College of Business

Home | Message Members | Add Faculty Page

DO NOT append School ID (001) to Member ID

Member ID* (4-7 alphanumeric) (Password will be initially set to be the same as Member ID)

First name or initial*

Middle name/initial

Last name*

☐ ChairHead ☐ Inactive

☐ Approve chair for evaluation

Department*

Area*

Email*

How Term*

Member Default Status: Changing the status here changes only how the list is sorted into the scheduled teaching schedules. To change the historical status of members and to add your changes reflected in the various reports, use the teaching schedules themselves.

Involvement* ☐ Participating ☐ Nonparticipating

Credentialed*

☐ Participates in the governance of the school

☐ Considered to be a long-term member

High Degree*

Year Awarded*

Rank*

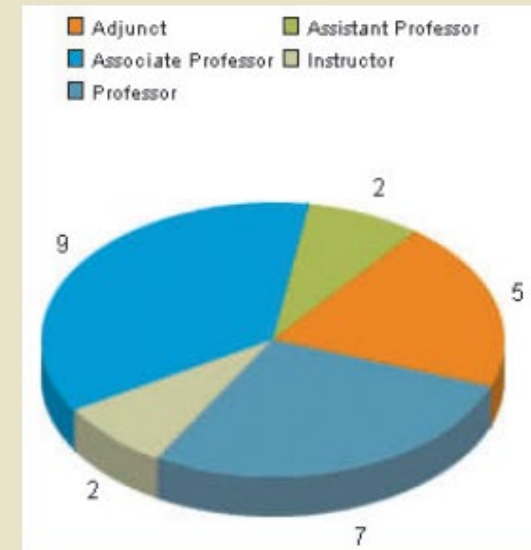
b) Raw data

ID	Last Name	Mid Name	First Name	Dept/Cdd	Office	Email	Rank	Hire Year	Degree
1	Washburn	A.	James	MGMT	B-115	jwashbu@mtsu.edu	Professor	200	Ph.D.
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4	McDon	J	James	FIN	B-2-6	mcdonj@mtsu.edu	Associate Professor	199	Ph.D.
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23	Greenland	G	Robert	ACCT	B-4-1	greenland@mtsu.edu	Associate Professor	199	Ph.D.
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25	McIntyre	E	Phyllis	ISYS	B-3-3	mcintyre@mtsu.edu	Adjunct	199	M.B.A.
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27	Wilson		James	ECOM	B-4-8	wilson@mtsu.edu	Professor	199	Ph.D.
28	Arndt		Walter	MKT	B-1-4	arndt@mtsu.edu	Professor	199	Ph.D.
29	Cadotte		David	ECOM	B-3-6	cadotte@mtsu.edu	Professor	199	Ph.D.
30	Freeman		John	MGMT		freeman@mtsu.edu	Adjunct	199	M.B.A.
31	Lincoln		Robert	ACCT	B-4-6	lincoln@mtsu.edu	Professor	199	Ph.D.
32	Johnson		Robert	ECOM	B-2-7	johnson@mtsu.edu	Professor	200	Ph.D.

c) Information in summary format

Rank	COUNT	%/INFS	TOT/COL	%/COL. TOT.	%/COL. FAC.
Adjunct	5	20.00%	23	21.74%	3.27%
Assistant Professor	2	8.00%	28	7.14%	1.31%
Associate Professor	9	36.00%	37	24.32%	5.88%
Instructor	2	8.00%	18	11.11%	1.31%
Professor	7	28.00%	47	14.89%	4.58%

d) Information in graphical format



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- **What is a database?**
- Database Management Systems
- Types of databases
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The Database

- Shared, integrated computer structure that stores a collection of:
 - End-user data - Raw facts of interest to end user
 - Metadata: Data about data
 - Describes data characteristics and relationships

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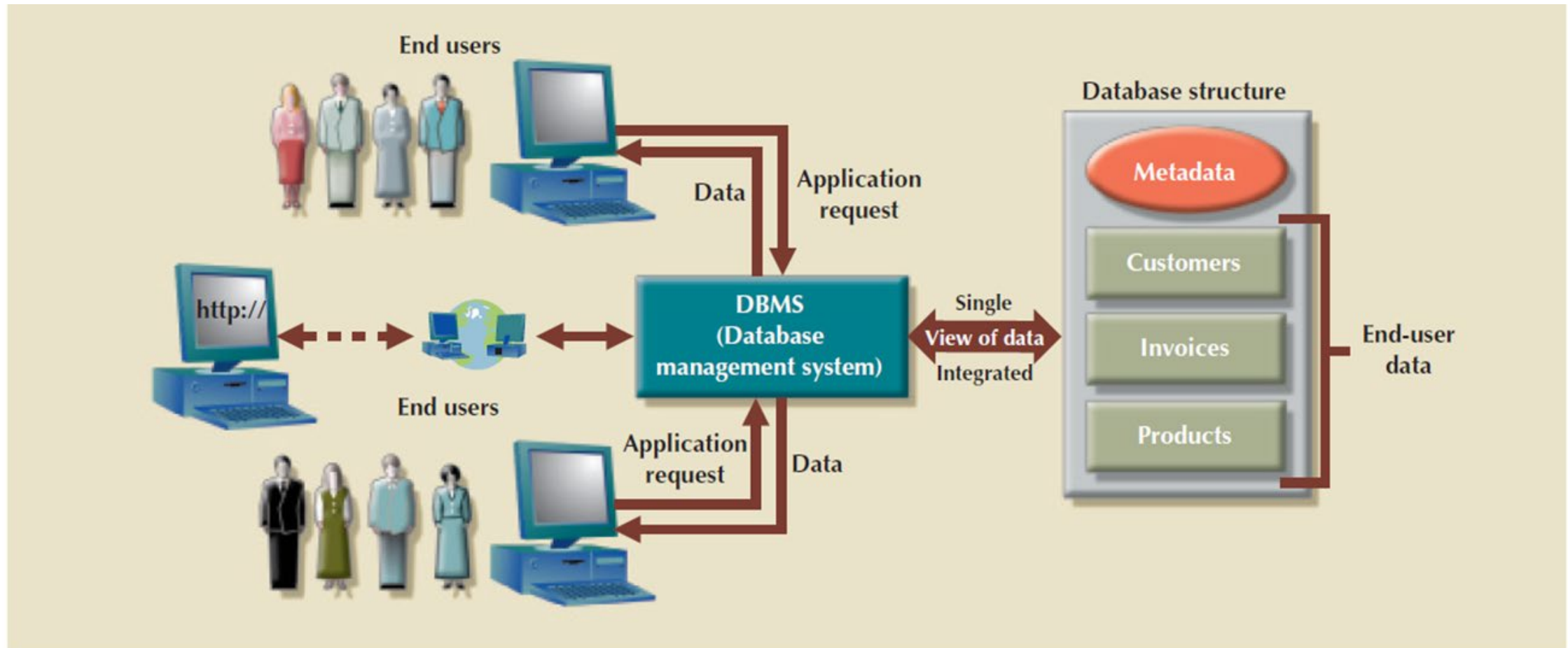
The Database Management System (DBMS)

- Collection of programs
- Manages the database structure
- Controls access to data stored in the database

Role of the DBMS

- Intermediary between the user and the database
- Enables data to be shared
- Presents the end user with an integrated view of the data
- Receives and translates application requests into operations required to fulfill the requests
- Hides database's internal complexity from the application programs and users

Figure 1.3 - The DBMS Manages the Interaction between the End User and the Database



Advantages of the DBMS

- Better data integration and less data inconsistency
 - **Data inconsistency:** Different versions of the same data appear in different places
- Increased end-user productivity
- Improved:
 - Data sharing
 - Data security
 - Data access
 - Decision making
- **Data quality:** Accuracy, validity, and timeliness of data

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Types of Databases

- Databases can be classified based on:
 - Number of users
 - Location of data
 - Type of data stored
 - Intended data usage
 - Structure of the data

Types of Databases – Number of users

- **Single-user database:** Supports one user at a time
 - **Desktop database:** Runs on PC
- **Multiuser database:** Supports multiple users at the same time
 - **Workgroup databases:** Supports a small number of users or a specific department
 - **Enterprise database:** Supports many users across many departments

Types of Databases – Location of data

- **Centralized database:** Data is located at a single site
- **Distributed database:** Data is distributed across different sites
- **Cloud database:** Created and maintained using cloud data services that provide defined performance measures for the database
 - Microsoft Azure
 - Amazon AWS

Types of Databases – Type of data stored

- **General-purpose databases:** Contains a wide variety of data used in multiple disciplines
- **Discipline-specific databases:** Contains data focused on specific subject areas

Types of Databases – intended data usage

- **Operational database:** Designed to support a company's day-to-day operations
- **Analytical database:** Stores historical data and business metrics used exclusively for tactical or strategic decision making
 - **Data warehouse:** Stores data in a format optimized for decision support
 - **Online analytical processing (OLAP)**
 - Tools for retrieving, processing, and modeling data from the data warehouse
- **Business intelligence:** Captures and processes business data to generate information that support decision making

Types of Databases – structure of the data

- **Unstructured data:** It exists in their original state
- **Structured data:** It results from formatting
 - Structure is applied based on type of processing to be performed
- **Semistructured data:** Processed to some extent
 - **Extensible Markup Language (XML)**
 - Represents data elements in textual format

TABLE 1.1

TYPES OF DATABASES

PRODUCT	NUMBER OF USERS			DATA LOCATION		DATA USAGE		XML
	SINGLE USER	MULTIUSER		CENTRALIZED	DISTRIBUTED	OPERATIONAL	ANALYTICAL	
		WORKGROUP	ENTERPRISE					
MS Access	X	X		X		X		
MS SQL Server	X ³	X	X	X	X	X	X	X
IBM DB2	X ³	X	X	X	X	X	X	X
MySQL	X	X	X	X	X	X	X	X
Oracle RDBMS	X ³	X	X	X	X	X	X	X

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Database Design

- Focuses on the design of the database structure that will be used to store and manage end-user data
- Well-designed database
 - Facilitates data management
 - Generates accurate and valuable information
- Poorly designed database causes difficult-to-trace errors

References

Recommended Textbook and slides

Database Systems: Design, Implementation and Management; 12th edition;

By: Carlos Coronel; Steven Morris

Next Class?

- How modern databases evolved from file systems
- Introduction to Structured Query Language