Title slide:

Hello professor, I hope you had a great week.

Today I'll be discussing this week's topic of Databases and information systems.

I hope you enjoy.

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Topic intro:

Let's look at the topic's I'll be talking about.

So, we have database management systems,
Database models,
The relationships between databases and the digital economy,
Information systems in organization,
Database administration,
And specialized databases.
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Database management basics:

First, I'll be talking about the basics of database management.
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So what is a database?

Well, a database management system (or DBMS), is best defined as a piece of software (either online or local) that allows users to create, control and manage databases and their information.

It's a very efficient way for businesses and organizations to store, organize and retrieve large amounts of information.

Stated on Splunk.com, a good way to think of a database is as an "electronic filing cabinet".
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Database management systems include several different components, which include: hardware, software, data procedures,
Database access query language (such as the programming language SQL),
And users (which can include database admin and its developers).

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Of course, with database systems comes database models.

Database models are structures that describe the way that data is organized in a database.

There's a variety of types of database models.

First up, is the **Relational database management system**, or RDBMS. This is the most common type of database model, and it stores information in the form of related tables (Quoted from Splunk). RDBMS also uses SQL.

It's a popular model due to its ease and flexibility, and is great for inventory records, invoices, and patient visit entries.

Some systems that use the RDBMS model are MySQL, Oracle, and Microsoft SQL Server.

Next up, we have **NoSQL**, which in fact stands for "Not only SQL". NoSQL is used for large amounts of unstructured data, like social media data. MongoDB, Cassandra, and Couchbase all use NoSQL.

It's also important to note that this model does NOT follow the traditional RDBMS system.

NoSQL is good for real-time data analysis for Internet of Things devices and analyzing e-commerce data.

I find it interesting that this model can be broken down into different categories, including document-based, key-value, column family, and graph-based.

The **Object-Oriented DBMS**, also called the OODBMS, stores data within objects. It's also considered a type of NoSQL model because of how Object-Oriented systems don't follow a structured format.

Some databases that use this model are Versant and Objectivity.

The Object-based DBMS is good for "real time processing of data relationships in telecommunications, managing product lifecycle in software development" (quoted from Chia in 2023 on Splunk).

Hierarchical DBMS's were the first ever model to be used in databases. They organize data in a tree-like structure and are known for its fast and efficient data retrieval.

The IMS (or Information Management System by the company IBM), and the Windows Registry utilize this model.

It's also best to use when dealing with data with a parent-child relationship, like banking transactions or medical records systems.

Finally, we get to the **Network DBMS**, which represents data as nodes with links to other nodes, similar to how a network itself works. The links represent data relationships.

Because Network database management systems can support complex data relationships, it's good to use for baking, airline reservations and government systems.

Some database systems that use this model include Integrated Data Storage (shortened to IDS) and Integrated Database Management Systems (or IDMS).
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Next, we're gonna have a look at specialized databases.

Specialized databases are basically like regular databases, except they store a specific type of information.

Their purpose is to improve the accuracy of data retrieved and to provide full-text access to its users.

PubMed is a great example of a specialized database. PubMed has nearly 30 million medical and scientific references such as MEDLINE and PubMed Central.

PubMed serves as an ideal resource to use for medical, health and science studies.
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So, why bother using a database management system?

Some of the advantages of using a DBMS includes the following:

Improved data legitimacy,
Improved security and access control,

Backup and recovery options,
And the scalability of data.

Meanwhile, some other benefits include efficiency with identifying, labeling and analyzing data, and the portability of data.
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How is data stored:

Now let's talk about how data is stored digitally.
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Here I have a table that represents the order of the hierarchy of data.

At the bottom are **bits**. Bits are the smallest unit of data that are represented by one's and zero's, with zero's representing "false" and ones representing "true".

Bytes, also called characters, are a combination of bits that can be letters, numbers or special characters.

Fields consist of one or more bytes. An example of this includes name, address, or your phone number.

Records are a collection of related fields, such as a group of your personal information.

Files are a group of related records. For example, information about all members of a medical facility would count as a file.

At the very top is a **database**, which is a group of related files.

As you can see, the pattern here is that all of the data types of just essentially groups of one another.
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Database trends with e-commerce:

Let's discuss database trends with eCommerce.
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Next is a little review on the reasons that people, specifically businesses, use database management systems.

Businesses like to use databases for the following reasons:

Better-informed business decisions,

Improved campaigns,
Optimization of business operations, and
Reduced business costs.

All of these factors are used for the main goal of increasing business revenue.
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Some popular trends of databases in the digital economy are:
The usage of cloud services ("cloud services" referring to online services that save information to those online servers),

The integration of modern technology with data management (such as the usage of AI technologies for redundant tasks and identifying errors),

And the growth of edge computing used to collect and process data.
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The **digital economy** is a large online business place where users and businesses can connect through digital means.

E-commerce is the online exchange of goods. For example, when you are shopping online and using a platform like Amazon eBay, you are participating in e-commerce.

E-commerce is also a type of e-business. An **E-business** is a broad term used to describe selling, purchasing, or other business activities done through the internet.
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Here are some of the least popular trends.

Based on authors from a TechTarget article, **data fabric** is defined as "an architectural framework that aims to better unify data assets by automating integration processes and making them reusable".

In other words, data fabric is used to merge data from different sources together, and is stored in a specific space to make it easier for users or groups to access that information.

A **data mesh** is also a type of architecture that (also from TechTarget) "gives data ownership and management responsibilities to individual business domains".
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Now we're gonna be talking about database administration.

Database admin maintains, secures and operates databases.
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There's many different types of database administrators.

For starters, system admin is responsible for the overall management of computer systems. They oversee updates, configurement, and applying security patches, as well as monitoring the database's performance.

Database architects design databases.

Database analysts collect and analyze data to use in order to improve a database's performance.

Data modelers create database models that, according to Oracle, "depict the relationship between data elements".

Application database admin regulates the databases for different app support. This includes installing and configuring apps, checking that data is synchronized correctly, and troubleshooting.

Task-oriented admin work in specialized areas of database administration such as recovery and backup, security and performance.

Performance analysts primarily monitor a database's performance, analyzing it and seeking areas of improvement. They also create data reports and give recommendations to the other admin.

Data warehouse admin stores data for businesses or applications. This involves extracting, transforming and loading data into warehouses.

And last up, Cloud database admin controls and manages databases that are on the cloud.
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Let's sum up everything we previously discussed.

We learned about the basics of data management,

Different components and types of database management systems,

Specialized databases,

The benefits of using database management systems,

How data is organized via a hierarchical system,

Why and how businesses use database management systems,

Popular and less-used database trends with the digital economy,

And the different types of database administrators and their roles.

Below are the references to all media and information included in this presentation.

Thank you for watching and have a good day.