**Computer Aided Decision Systems Industrial Practices using Big Analytics**
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**Lecture – 5**
**Overview of Database Management Systems**

Good afternoon students, welcome to yet another session of Web-based Decision Support Systems for Managerial Decision Making. And yes you might have seen, gone through the current lectures or earlier lectures you have noticed that we have been talking about different components what the need of the DSS the type of decisions and wide decision support systems are important to tackle unstructured business decision problems which are very common in day to day operations and of various business organizations and we have seen the major components of it.

And today our lecture we will be talking about one of the biggest components of the decision support system which is the database management system. So, without any further delay let us look into today's slides.

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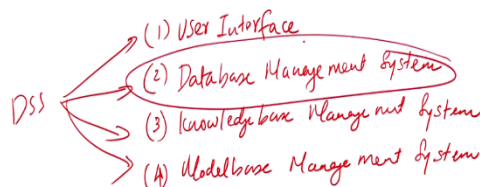


So, what we are going to talk today is the database management system for decision support system. So, these are components remember we have talked about multiple components:

1) User Interface

2) Database management System

3) Knowledge Base management System

4) Model Based Management System

We told about all these are the critical components of DSS spread into four and today we are going to talk about Database Management System. User interface and etcetera we will talk later.

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**Components of DBMS Sub-System** *(Concept & need)*

- Database
- Database management system
- Data directory
- Query facility
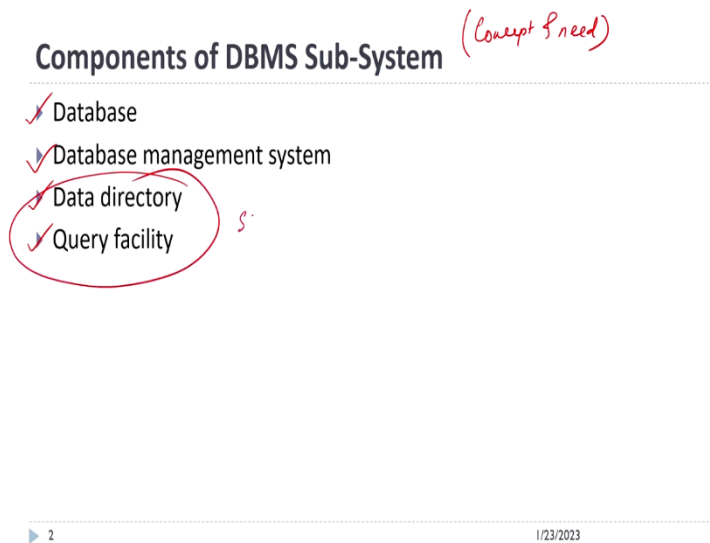
So, the major discussion today we will talk about is here again, this is like Concept and Need that is the part we will be discussing as part of this. So, we will be talking about:

    A.  What is the Database? What is the need of a Database?

    B. What is the Database Management System? Why is it necessary?

    C.  What is a Directory and Query Facility?

    So, these kind of things will be combined together to will be in the schematic thing we will talk about.

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The Viewpoint is the web based DSS (aiming for Corporate decisions on unstructured problems)

## Database

▸ A collection of related data                                    underlying
  (1) Logically coherent collection of data with some inherent meaning (inter-related data).
  (2) inter-related data is usually extracted from various sources, stored for usage in future,
      and queried as and when necessary to extract relevant information (answer specific
      Sources: processes, machines, sales, Customer feedback, HR, etc.        question)
▸ The data from the DSS database are extracted from: (from business stand point)
  (1) Internal data — usually from TPS (also ERP data, sales etc) — internal to the organization.
  (2) External data — external to the organization (from government agencies, trade association,
      market research firms, fore casting firms, stock exchange, etc.
  (3) Private data (or) guidelines used by decision makers. (experience / rules of thumb, etc)
▸ A database is designed, built, and populated with data for specific
  purposes (Should cater to all sources of data to facilitate all forms of decision making)

▸ 3                                                             1/23/2023

So, let us get into some basic understanding:

A. What is a Database?

 There are lot of definitions available but the viewpoint here, viewpoint is the web based DSS aiming for corporate decisions on unstructured problems. So, we already mentioned earlier remember we talked about unstructured, structured, semi structured problems, but here the focus for us is the unstructured problems and how the decision support system is supposed to help it.

➢ So, for us we define database as a collection of related data. Critical thing is, it is a collection and what type of data, we just do not want to call it a collection of data, we call it as related data. So, what are the important aspects of this? The first aspect of it is, it should be a:

1) Logically coherent collection of data with some inherent (underlying) meaning.

We can call it as inter-related data. So, it should be a logically coherent collection that is the first criteria of data with some inherent meaning. Inherent meaning means it is capturing some process underlying aspect which is generating the data.

Second part we have to talk about is- Inter-related Data:

2) Inter-related data is usually extracted from various sources, stored for usage in future, and queried as and when necessary to extract relevant information. Information is a loose word here, you will say (answer specific question).

So, various sources are available for the interrelated data and some of the sources are:

i)         Processes

ii)        Machines,

iii)       Sales,

iv)       Customer feedback,

v)        HR, etc.

So, there are many sources of data you can think about.

These type of data is usually extracted from various sources. Then once you extract it, what you do? You store it for the future usage. And then after you store it, what happens? You query it, or you try to extract, what you need out of this.

So, you query the stored data you basically go through and query the stored data to extract whatever is the relevant information for you, or whatever information you can get so, that the current question in your mind can be very well answered.

Where do these sources comes into this?

i) There are processes, it could be:

- manufacturing processes,

- service processes, etc.,

ii) It could be various machines:

- drilling machine,

- milling machine,

- welding machine.

iii) Sales:

- the sales of the products or services

iv) Feedback of the customer:

- if in the hotel, the guy who is in the hotel, he gives the feedback

v)   HR is a human resource data.

- how is the employee performing, the annual performance of the employee, etc. all these are basically created as part of this.

So, all these various sources creates data which are inter-related in nature and we capture them and we store them for future usage and future usage typically means you continue to query them or you continue to extract the necessary information out of the stored data.

➢ Second form of data is the data from the DSS database. So, now the database we are talking here is only related to the DSS. This is from business stand point. We are looking at from a business angle.

1) Internal data- usually from TPS, remember what is TPS, (TPS is known as Transaction Processing System.) This can be in certain cases you can also it as also (ERP data, sales data, etc.). These are all coming as part of its internal data to the organization. This is internal to the organization.

2) External data- external data it is like you know, is external to the organization typically from (government agencies, trade associations, market research firms, forecasting firms, stock exchange, etc.) are the various sources of external data.
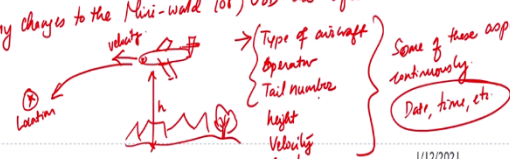
3) Private data or guidelines used by decision makers- This could be what we call as experience or rule of thumbs, rules of thumb, etcetera. What we are saying here is that, this private data or guidelines are sometimes not internal and external this is mostly related to the decision maker the individual himself or herself makes.

➢ With this info, what is a database? For us a database is designed, built and populated with data for specific purposes. (Should cater to all sources of data to facilitate all forms of decision making.). When you design it, when you build it, and when you populate it with the data, the specific purposes that is for making the corporate decision but it should cater to all sources of data, which includes internal source, external source, private source, etc. and it should facilitate all forms of decision making, whether it is a structured, unstructured, semi structured decision making, all those kind of decision making are something that the system should capture.

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*(We study this from the DSS View point)*

## Data

▶ Definition: known facts that can be recorded and have an implicit meaning.
 ↳ these "known facts" should also be verifiable (establish the veracity)

▶ **Mini-world:** Some part of the real world about which the data is captured / collected and stored in a database

⇒ Many Scholars/researchers/books also refer to this as Universe of Discourse (UoD)

⇒ Any changes to the Mini-world (or) UoD are reflected in the database.

velocity → (Type of aircraft, Operator, Tail number) Some of these aspects changes continuously.

Location → height, Velocity, Location

(Date, time, etc.)

▶ 4

1/12/2021

With the database, let us move to what we call as, What is a Data? There are so many definitions of data, but we study this from the DSS viewpoint.

➢ Definition: Known facts that can be recorded, and have an implicit meaning.

Most of the time we can say that these are known facts, facts that are known or you have a way to identify that this is a fact and can be recorded. We can record it and it can have an implicit meaning sometimes. These known facts whatever you want to call it, should also be verifiable. You should be able to establish the veracity, you should be able to verify, you should be able to assure that, this is the fact.

If you talk about the known facts that can be recorded as we said and have an implicit meaning then there is a word that we need to learn about or that we need to consider as part of the data is called Mini-world. We can define it as:

➢ Some part of the real world, about which the data is captured or collected and stored in a database.

We are talking about some part of the real world and what is the important thing about this part, we are able to capture or collect data and then we store it in a database. So, whatever the data we capture, we should be able to make sure that data can be verifiable. This is also you should remember that in:

➢ Many books, scholars, researchers also refer to this as 'Universe of Discourse' (UoD).

When you hear the word 'Universe of Discourse' you are basically referring to is the Mini-world.

So, another way to think is:

➢ Any changes, to the Mini-world or UoD are reflected in the database.

Imagine a scenario that, there is a aircraft that is flying. There is ground, it is at height, and it is flying with the velocity, and it is going to particular location. You can think about as the type of aircraft, air operator, tail number, height, velocity and location. If you capture this much, the thing is this will keep on changing at every time the aircraft moves from one place to another. 'Some of these aspects changes continuously'.

If you do then what you have to do? you may have to take a date, time, etc. Also you need to capture to make sure that each one of these may not change. These may be relatively constant the other aspects whatever is changing you should be able to capture it, and make sure that at on 23rd of January 2023 at 7:53 PM, this was the particular height at which this particular aircraft with the tail number VT, flying at an altitude 5000 feet above the ground was flying with 600 knots.

It is not just that you capture it, but it is captured in such a way that it makes sense and it can be validated or verified in the later time period to come.

So, previously we talked about, What is Database? Now let us talk about, What is database management System or popularly known as a (DBMS). DBMS a lot of the time in the simplest sense, what is it? It is a software package:

➢ (or) a collection of Computer programs- to facilitate the creation and maintenance (or maintaining) of a computerized database. When you say maintenance it is not just annual maintenance or electricity or something it is more like updating, deleting etc

The database is something that you do not write it in a ledger it is something that you actually store it in a computer.

➢ What are the major functions of a DBMS? Major functions of DBMS are:

1) Define- specify data types, structures, and constraints. What are data types? we have heard about this word in many places, this could be something like it can be integer, real number, characters, string, date, time, etc. These are the different data types as part of it and then it also talks about different data structures to capture the data and example of constraints, like a date can be written as DD/MM/YY, it can also be written as DD-MM-YYYY etc. So, these are all can call it as a type of constraints.

2) Construct- it is the process of storing data (also called as loading the database).

3) Manipulate- retrieve specific data, update and reflect the current UoD. What does it mean that, you manipulate the existing data in such a way that it is a true reflection of the current status of Universe of Discourse.

4)  Share- it allows multiple users (can also be a single user, multiple user,) / programs (it does not have to be an individual human being, it can also be a computer program) to concurrently (simultaneously without causing error) access the data. The point is that it allows us to share the database among multiple users (different individuals or different programs concurrently)

5)  Protect- there are two types of protection;

i)  System protection- against any hardware or software malfunction. The common word for this is crash.

ii)  Security protection- is against any unauthorized access. That means only genuine and allowed users.

6)  Maintenance- allow the system evolution to reflect change in requirements over time. As time progresses, UoD status changes, capture, and reflect those changes.

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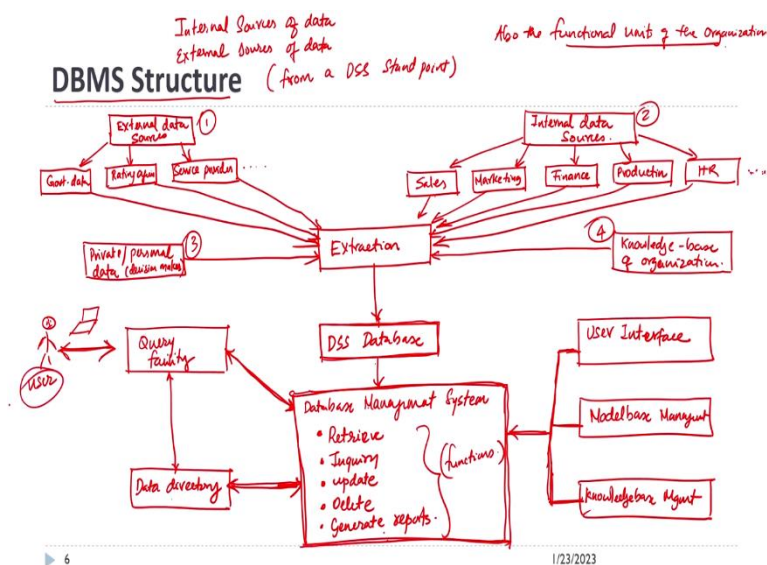


Now let us get into DBMS structure and we will try to study this in a schematic form. So, remember we have talked about internal sources of data and external sources of data earlier. And we also talked about the private data etc. So, database structure from a DSS standpoint, we are going to do is, we are going to look at from a DSS viewpoint.

1)  The first part is the Internal data sources. Some parts of it are: sales, marketing, finance, production, and HR, etc. We can also kind of call these ones as also the functional units

of the organization, sales, HR, etc., they are all functional units and each one of the functional units you capture the data sales will have its own data marketing, have its own data finance, have its own data, etc., HR and this continues like this.

2) External data sources- some of the external data sources as government data, rating agency, service provider, many stock market etc, these are all aspects of data. So, you have internal sources and external sources and we combine all of them by a main function called as extraction. We extract data from all these sources all these internal sources and also we extracted from the external sources of data. So, the extraction function takes care of collecting, extracting relevant data

3) Private / Personal data of the decision maker- the private or the personal data of the decision maker is one other aspect

4) Knowledge base of organization- Each individual knowledge base of the organization is also captured as part of this.

Once all of this is done, from here extraction we call as the DSS database. So, this extraction process is the primary motive of creating this decision support database as drawn in figure. And then this database works with what we call as a Database Management System. As we said, there is a computer software, what it does, it basically allows you to retrieve, inquire, update, delete, generate reports, etc. So, it can do many functions.

This capability is accessed by the user, For ex- there is a user he accessed this through what you call as the query facility. Let us call the person as user. So, there is a query facility that is provided by the database which will give you access to both sides, you can interface with the database and to query the database you need to know what is the data that is contained in it.

Now, you need the query facility to interact with the data directory and using the data directory and the query facility, you interact with the DBMS. So, the user interacts with the DBMS, either input or output etc, the person has a computer, that computer provides what you call as a query facility, and the query facility uses DBMS, and the data directory to give you information whatever it is.

There is also something else which is should also be thought about this, you have other major components:

1) User Interface,

2) Model base Management, and

3) Knowledge base Management.

All these three should also have capability to interact with the database. Purely because of the fact that, at some point of time they will also start storing some of the information using the DBMS so, that it can be processed later.

So, in a way you can think about DBMS in this case, it becomes the central storage plus processing point, this basically becomes the backbone of the system. So, you can populate it or you can create the DSS database what we talked about through the process of extraction, from both internal sources, external sources, private, and personal data. So, here is you can think internal, external, then private and the knowledge based, these four options that will extract from every place and create the DSS database.

It also provides a query facility for the user to interact with the system, is the user. And also the other three major components, user interface, model base, and knowledge base, these are the components of the DSS also to interact with the system as part of this. So, with this we have reached the overview of database management system which is one of the critical components of the DSS.

And we will similarly look into the other three critical components which are the user interface and model based management and knowledge base management quickly, in the next lectures. So, see, how it is interrelated, how each one of them are interconnected. Focus on each one of the quickly, so that we can get into the integrated details or how do we build a user interface, what are the main things that you need to look into it, how do you build a model based management system, what is a, what are the knowledge base management system, how do we do that, how do we capture knowledge, etc, all those aspects that are critical to the web-based DSS for corporate decision making, we can study in the coming classes.

So, thank you very much for your patient listening and we will continue in the classes to come, with the remaining topics. Thank you.