

Advanced Business Decision Support Systems
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Lecture 03
Business DSS Subsystems

Good evening, everyone, yet another Welcome to the NPTEL MOOCs course, Advanced Web-based Business Decision Support Systems for practitioners and also researchers. I am Deepu Philip from IIT Kanpur and along with me, the co-instructors of this course is Dr. Prabal Pratap Singh and Dr. Amandeep Singh Oberoi and among three of us, we will be covering various aspects of Advanced Business Decision Support Systems. And, we have been going through major topics yesterday specifically on recouping what the previous course.

The precursor course of this has covered in Decision Support System. And, mostly on the Web-based DSS and the fundamentals of it. and, we have already gone through a general architecture and also what we have discussed is what is the Database Management System or Component of it. And, today we will be discussing the Model Based Management System onwards.

So, let us take a look into the Business DSS, what do we call the Model Management Subsystem. So, as I said earlier, we have covered the details in other topics, we are going to do a schematic representation first. So, Diagrammatically, we will talk about this.

Typically, the first component what we have the Models. The Models is also called Model Base, some people also call this Model Base. And, typically multiple things there are; One is the Strategic, the other is the Tactical. Strategic is a long term, Tactical is a short term. Then, there is Operational which is day to day, kind of a thing.

Then, you have Statistical, then you have Financial, then you have Engineering, etcetera. So, these kind of Models or Model Base will be there, and also you have along with this something called the Model Building Blocks. So, the necessary things that you require to build these Models are also associated with this.

Then, you also have along with that something called the Model Base Management. And, what does it do, basically managing the Models. The main things that happens here is

Modeling Command Creation. The other part is the Model Maintenance. Maintenance means upkeep and update, etcetera.

Then, Database Interface because each Model will require specific set of data to be fetched from the Database. Then, also what we call the Modeling Language. These are the main aspects of this.

So, a Programming Language where you can actually create Models is as part of this. This is the Model Base Management and then, what you have along with this is the Model Directory. For a person who wants to interact with the Models, a model directory is important because you need to know which Models are there that will fetch the data from here. And, it will also interact with the Model Base Management in this regard.

And then, the Model directory, along with, what you call the Command Processor. I would usually say this, which is Model Execution, Integration and Command Processor. And, this interacts with the Model Base Management, the beginning aspect of this.

So, one way to think about it is, this much block what I just drew here, you can call it the Model Base Management Subsystem. This is the Model Management Subsystem. We can talk about at this point.

Now, the Model Execution and there is the Model Base Management is also the same thing with which is the same in stuff, with which you have User Interface, which is outside. The User Interface is right here. This User Interface interacts with the Model Base Management Module.

So, User Interface also act as the 'via medium' for the user to deal with it. And then, once it connects to the Model Base Management, it also uses the Command Processor. The Model Execution, Integration, Command Processor and the Model Directory through which it will actually operationalize various Models, as part of this.

And then, there is also through this we can do something like this, we have what we call Database Management, that is one part of the puzzle and, the other thing is Knowledge Base Subsystem and there is the Database Management.

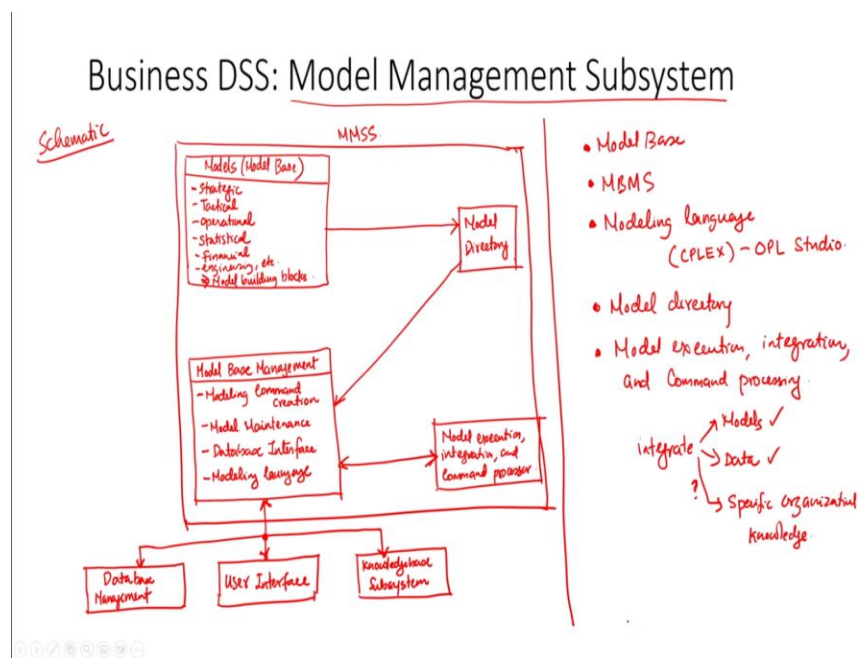
So, along with the User Interface, sometimes you may need to fetch things from the Knowledge Base, sometime you may need to fetch things from the Database Management, but integrating all of them with the help of User Interface, you interact with Model Base Management stuff and go from there.

The critical aspects of this, the main points of this is the:

- Model Base
- MBMS (the Model Base Management System)

- Modeling Language. An example of a Modeling Language is CPLEX. It is related to what you call OPL Studio (Optimization Programming Language), it is a Modeling Language where you can write the simplex Models, related to it.
- Modeling Directory
- Model Execution, Integration and Command Processing. The Integration here is, you need to integrate what do you need to integrate? You have Models, you have Data, and, you may have, this is a question mark (?) Specific Organizational Knowledge, this may or may not be there. These two are definitely necessary, Model and Data is definitely necessary.

Depending on the situation, you may or may not have the Specific Organizational Knowledge, which is part of this exercise. So, this is the overall idea of a Model Base Management Subsystem in a schematic fashion.



Now, we will go into the next Subsystem, which is called in a Business Decision Support System, we call the User Interface Subsystem usually or in old school it is also known as the Dialog Subsystem. And, we have already discussed this in a very large fashion in the previous lecture. Now, we are going to do a schematic view of this or we are going to use images to diagrammatically understand what this whole system is about.

So, as usual we now have 3 Subsystems. So, let us make 3 boxes. We will call Database Management and DBMS (the Database Management System), that is one part. Then,

second aspect we are going to draw is the Knowledge Base Management Subsystem. And then, the third one we are going to do is the Model Based Management Subsystem.

These 3, and you have as we drew earlier, we are just looking it from the other viewpoint. we are just doing top down at this point. User Interface Management System or what we call UIMS. So, as usual we drew this figure like this, they are all 2-way interactions. The User Interface Management System does interact with all of this.

And, below that we have the next. When we usually call it NLP or Natural Language Processor. It is again 2-way interaction. So, you need English for the user to interface with this.

And then, from there Natural Language Processor creates it into, we can call it 2 boxes in this. One is the Input box and another is the Output box. And, the Input is the Action Language and the Output is the Display Language. And, all of these things happen as part of I do not want to draw solid lines in this sorry. We will put dotted lines on this to make it more. I am going to call this PC Display. The monitor is basically having both of this.

The Natural Language Processing will deal with both the Input and the Output aspects. of the one which you use is the PC Display on which you will actually see this. You may have the Display Language or the Output. It may also have what we call Printers, Fax, Scanner, etcetera. So, that is scanner is not really, but we can call it a part of this for the time being, and, that is part of the Output. Printer and Fax, Plotter, etcetera, all those kinds of things.

And then, there is something called what we call the users. And, users have provided their input through the Input Language and, they receive the output through the Output Language or Display Language. They basically use Natural Language to interact with the input using which is on a PC Display or a Computer Monitor. And, they use the User Interface using English, they interact with this.

The Natural Language Processor takes that input and using the User Interface Management System interacts with the other three; the Knowledge Base, the Database and the Model Base.

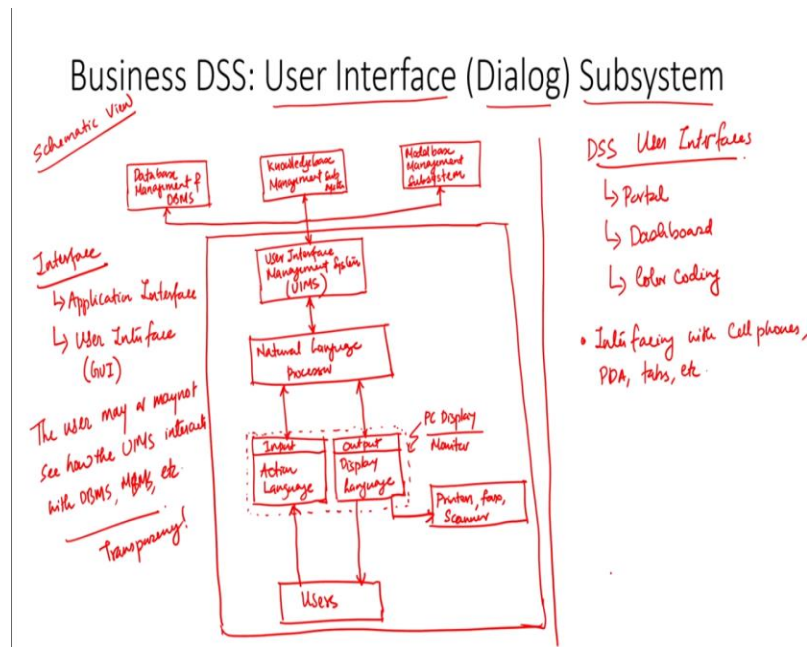
In broad sense, the UIMS Subsystem, we can talk about I would include this one also. This is what you can call the UIMS Subsystem. When we talk about the Interface, in this regard, you have to remember there are two Interfaces.

- One is the Application Interface. So, the Model may have an Interface which will talk to the Database to fetch the data and other things.
- The other one is the User Interface. The User Interface is what we typically get to call the GUI or the Graphical User Interface as we mentioned in the other part.

So, when we talk about what the User sees is the GUI which is User Interface. the Application Interface may or may not be transparent. The user may or may not see how the UIMS interacts with DBMS, MBMS, etcetera. It may or may not be visible to the user. So, the idea is that, it is transparent, that is the transparency part of it. We have discussed this in detail in the previous course. You can go through that and understand that.

The other part is we also need to understand is the DSS User Interfaces. There are multiple ways you can have.

- One is what you can think about a typical Portal Approach can be done.
- You can have the Dashboard Approach or what you can call Graphical Icons.
- You can also have the Color Coding.
 - And, you can also have something like the Modern Systems with the IOT and other things. You can think about it as interfacing with cell phones, PDA, tabs, etcetera or the connected system. So, all of these are thought through when you are creating the DSS User Interface. It may not just a fancy looking color coded thing, but it is more relevant to what is being thought about.



So, now let us talk about the last aspect, the Knowledge Base Management System (the KBMS). This is the third component, we already seen the User Interface, the Database

and the Model Base. Now, the fourth component, if you remember, I wrote this the + Optional.

- So, the main idea of this Knowledge Base Management Subsystem of the DSS, especially Corporate DSS is to Incorporate Intelligence and Expertise. Expertise is Capabilities that are gained through prolonged years of operation. For example, if you look into it, two companies Rolls Royce and GE are capable of making gas turbine engines or jet engines for aircrafts. And, they do not share the expertise of how to make those fan, blade, etcetera. They keep it as a big secret purely because of the fact that they gained that knowledge through expertise, through prolonged years of operations, in that way.

Anyway, the idea of having a Knowledge Base is to capture the Organizational Intelligence. The word that we will be using here is Organizational Intelligence and then, Organizational Expertise. The aim is to capture both of them ,that is why the Knowledge Base is created, as part of this.

Now, what are the major components of the Knowledge Base System? We need to know what are the Knowledge Base System and its Components, which are knowledge components.

- So, the first one we can think about it as Expert Systems. Expert systems is we have discussed what is an Expert System in the previous course. So, just I am refreshing you that.
- Then, we can also talk about as Neural Networks. I am pretty sure in the previous course Dr. Amandeep Singh has discussed about this. We will do a small example of this in the class, a perceptron kind of a thing, in this course, but that is what it is.
- We can talk about what we call Intelligent Agents like chat boards, let people talk about chat GPT now, but earlier you have an intelligent chat board where you can pause your query, IVR, etcetera, these will come as part of this.
- You have like Fuzzy Logic Control. So, instead of Binary or that kind of a control you have Fuzzy Logic which gives you a scale between 0 to 1.
- And, you can talk about Case-based Reasoning Systems, etcetera. This is like if this and, this and, this is true, then, that kind of depending on what case you are talking about or the scenario what you are talking about you can have this also as part of it.

So, what do these guys do and why do you need a Knowledge Base Management?

- The fundamental reason is you can use all of these to manage better other DSS components. So, the logic is this, if we can incorporate Organizational

Intelligence and Expertise, and-or you can say either and-or Expertise then DBMS, MBMS, UIMS can be managed better. This is another way of thinking about it.

So, that is another reason why the Knowledge Base Management System is important because remember, in the previous lecture we have already shown that the Knowledge is the fourth aspect, the Plus Optional. I have discussed this in the previous section. Now, we completed this.

We will conclude this concept with the current developments or what are the current trends that are going on and I would like to break it down into 3 parts. Current Developments are I would say that 3 main drivers. The current trends are driven by 3 main drivers.

- 1) The first driver let us take this one as the Hardware enhancements. We can talk about it as whether it is in the memory or somewhere else. For example; Computation or Processing, Storage then, Connectivity, etcetera. All these things you can think about it as the major aspects here are
 - Smaller
 - Faster
 - Cheaper.

So, as I mentioned in the previous lectures, I usually give this example, when I started learning computer, we used to use what you call 256 kB, 512 kB floppy disk, which I am pretty sure that the current generation may not even see those things. Then, came SIP disks, then came external hard disk, USB pen drives. Even when the first pen drive came, they were in megabytes.

Now, we have pen drives in terabytes. So, we have become from earlier storages used to be in large scale disk or tapes which used to take a room. Now ,we just have a thumb drive or a pen drive where you just put it in your pocket. So, things have become smaller, faster and cheaper. Those Hardware enhancements do drive lot of the current developments in the Decision Support System.

- 2) Now, we talk about the Software Advancements. Instead of the software, I would also add one more thing is Software Applications Advancements. Some of these you can think about it like,
 - Web Technologies
 - XM
 - Web Services
 - Grid Computing

- Cloud Computing
- Data Warehousing
- Data Mining

So, these are all Software Advancements or Application Software Technologies, Application of Data Warehousing, etcetera. They also end up driving the developments in Business DSS (Business Decision Support Systems).

- 3) Then, the third one is Integration of AI (Artificial Intelligence). This is something that is driving purely by what we call the concept is
 - Smart Systems or where we say some level of autonomy in decision making. So, we are now trying to Artificial Intelligence Systems where actually try to mimic human activities in DSS because a human being is making the decisions. So, we try to create or mimic the human decision maker and, Integration of the AI is also one other driver that drives the Current Developments in the Business DSS.

So, 3 main drivers once again Hardware, Software and Integration of AI. So, with this we come to the conclusion of this concept, this topic, and, we will now talk about the Taxonomy and Suboptimal Decisions, Structured and Structured Problems in the immediate lecture and that should cover the first week material. So, stay tuned for the next lecture. Thank you.