Advanced Business Decision Support Systems
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Lecture 04
Decision Support Taxonomy- General

Good evening, everyone. Welcome to yet another session of Advanced Business Decision Support Systems course which is continuation of the previous course in MOOCs on Web-based Decision Support Systems and I am Dr. Deepu Philip from IIT, Kanpur, and along with me, Dr. Amandeep Singh Oberoi and Dr. Prabal Pratap will be co-teaching this course.

And, we have already seen an Overview of the Decision Support System so far and, we have also seen the specific details of the Major Components of the Decision Support System and, today we will discuss about the main aspects of Business Decisions.

So, today's topic is Decision Support Taxonomy. The nomenclature and other aspects behind it and the focus is Business Decisions. So, Without wasting much time let us start Analyzing Business Decisions. What are the main aspects of Business Decisions? Lot of the time we know the statement.

- Managers take actions. Or they do things or they take decisions and actions and why do they do this. The reason is, they do this on behalf of an Organization and Stakeholders. So, the bunch of people have came together, created an organization and they say that I am interesting you to manage my organization. I am giving you money to do that, but on my behalf take the appropriate decisions. And, what do they do? What are the main decisions that are part of this?
  - ➢ The main decisions that are part of this are Allocate resources and negotiate agreements. A major chunk of the action or decision involves on behalf of them are Allocation of resource agreement negotiation.
  - ➢ The other action is Monitor Performance, you monitor the performance, and Correct Deviations from plans or you can call it Goals. So, you keep on monitoring, where the the performance of the organization is going. If there is any deviations from the existing plan, then we change it.

  - ➢ Then, the third one we do as part of this is, also this is what they do most of the time, but the Stakeholders evaluate the Managers. They decide whether

to keep the Managers or not. Managers are evaluated on their ability to make effective decisions. It is not that they have to make just decisions, they have to make effective decisions. So, who evaluate them? The Stakeholders and the Organization evaluate the Manager, they say, we interested in this big company, your aim was to increase the shareholder value and everything and we were supposed to produce 10,000 cars by doing it or whatever at all. And, you have to do that and you already ended up producing 7,000 cars because of which you are not in profit, you are in loss. you took some decisions, but they did not turn out to be effective. So, you are an ineffective manager. So, get out of the job.

Even though, the decisions of the managers are in much different context, but the idea is that the actions which are outcomes of the decision is evaluated by the Stakeholder to determine the effectiveness of the managerial decisions.

- So, the fundamental questions that we are going to talk here are, what are the steps managers typically follow in making a specific decision? How do they end up making this decision?
- How do the corporate decision-making processes and when does a decision process begin and end? when does it starts and when does end? And, there are so many Models and so many approaches followed in the system. So, our aim is to discuss relevant approaches followed in Industry or in Businesses. That is what we will be doing as part of this again. The fundamental question again is how do the managers make a specific decision?

So, let us talk about there are many theories available to this and the 2 main important things for us from Business Standpoint. There is many other ways to think about it. The first one we call it a Normative Decision Theory and the other one we call it a Descriptive theory. What is the Normative Decision Theory?

➢ This is a theory about how decision should be made. Ideally, this is what you should have been made the decision.
➢ The Descriptive Theory is a theory about how decisions are actually made. And, you obviously would understand that our focus point is Descriptive Theory.

We will be looking from the Business Standpoint. Instead of talking about what should be the theoretic decision, we focus on different models on What is the actual decision or how is the actual decision gets made in actual context?

So, the Management Decision. We go into the Characteristics of Management Decisions. We are now talking about the Descriptive aspects, how the Management Decisions are being made.

- So, the main characteristics, the first and most important characteristic is the Managerial Decision making is a dynamic process. Dynamic process means it is evolving. It keeps evolving, changing, course correcting. You can use any fancy term you want. I am not going to stop you. We just called it dynamic process. It is like, as time changes, it keeps on changing.
- And, the Managerial Decisions are complex, most of the times. Complex in a sense, it involves uncertainty, variability, partial information, personal traits, so many aspects that are related to it. It makes it complex.

- Also, Management Decisions are usually ambiguous at times. Ambiguous means they are unclear. There is unclear or what we call haziness, etcetera. There are so many fancy management words you can put along with this, I am least bothered, but that is the one other aspect.
- And, Managerial Decisions also involved lot of the time, requires lot of information searches and detours. This is where lot of us faces difficulty in real life because in a touch book problem the data is given to you. The data given in table 7.3, using this, find this. In a real life, in an organization 99 percent of the time you would not know where the data is. Your job will be to first find out where the data is and then, once you figure it out, then, using this data I will make get insights and then, make the decision. Sometimes, you are like, oh I am actually not collecting this data, now what do I do? Let me first create the system to collect the data and then, I will make the decision. So, now you are going to make a decision. Now, you have taken a detour and now you are starting to instill a system whose main aim is to collect the relevant data. So, this also is a Characteristic of Management Decision.
- Then, another aspect is delayed feedback on results or you can call decisions or actions. Sometimes, I tell people that I am in a factory and, it is an automotive manufacturing and I decide that after the initial anti-rust coating I will put the car into a heated oven or solar radiation or something so that it immediately dries and then, I will paint, so that my production time reduces, I can produce more cars. So, I took a decision and I implemented it. Now, whether this is good or bad, whether it will impact the life of the paint in the car, etcetera, I would not know immediately. Somebody will buy the car from my company, they will drive it for few years and then, they come back and say your car after 2 years, the paint is falling apart. So, the impact of the decision may the chances of you knowing what

is the result or the outcome of your decision is not immediate, is not quick. So, its feedback is usually quite delayed.

- Then, you have what we call as Uncertainty. Uncertainty is many things are possible with some probability. We do not know which will happen.

  Some of this will happen, but whatever will happen, happens with some probability.

- And then, another aspect of the Management Decision is existence of conflicts during decision making. For example, my personal biases will get into the picture, I will give you a simple example. For me I believe, there are 2 types of people in an industry, the people who work and then, there is HR kind of a thing. So, if I am running a company, I will say that let us reduce the number of people who are working in the HR section, they are not contributing to anything to the production or anything. So, let us fire them. So, I will do something like that. Then, what will happen? The HR people and the other people will say no. The legal people will come and say you cannot do that there is a lot of affirmative action, equality, all this kind of things, for that you need people to do. We need people to go to the colleges and schools and hire, ask out for talents, for all this, you need human resource managers and I cannot take production manager out of this, that is their job, so, you cannot really throw them out.

So, now since I am the CEO or big guy of the company, the guy who told this legal ask, guy I do not like, you know I will throw you out, but since he is a legal guy, I will be careful, I mean I am just giving you an information. So, there will be so much of conflicts of opinion, fields, biases, feedbacks, etcetera, and all these things, then, I will finally say he is a legal guy, I should probably listen to him. I would not throw everybody from the HR, I will probably fire 20 percent of the people from the HR. I mean just giving HR as an example. I am more of an operations guy, that is why.

 So, when you say that or when you do that it is my bias driving the decision, and, my conflict with the legal guy rolled back some of that decision and this is true the other way around also. If another person in the HR comes into the picture, they will say that this production people are mafia, they need to be thrown out and we will run the organization. This is going both ways.

These kinds of conflicts are something that exist in business in an organization. When you have so many people and that need to be that will influence a decision making. Sometimes you may get good decision, sometimes you may get crap decisions, that is part of the game.

So, if that is the nature of Business Decisions then, let us talk about the Intended Use of Business DSS. What are the main uses of Business Decision Support System? There are so many uses, but let me broadly classify this into 4.

1) Strategic Planning, that is the first application of this. Strategic Planning is that people have many things, let us discuss this in the operational fashion. So, let us call it the decision process related to allocating resources, controlling organizational performances, establishing broad policies, evaluating investments, merger proposals, etcetera. So, these are some strategic planning. So, typically the idea here is, the logic here is long term that is a critical word for us, we are looking at long term thing allocating resources. So, where do we put the money? Money is not unlimited, I have x amount of dollars with me, where will I invest them? Controlling the organizational performance what we will do? Broad policies, for example, the Toyota and Suzuki decide to collaborate in India and they are started rebranding it. Now, they say that instead of going from petrol and diesel we will move more towards hybrid systems, etcetera. Instead of going to electric vehicles, that is kind of a broad policy. So, that you can see these are long term. Time horizons are long term. I am going to say it more like greater than 2 years broadly.

2) Management Control- So, to argue on this, it is the decision processes associated with acquisition and use of resources by operating units, buyer and supplier behavior or buyer and supplier analysis, we can call it that way, new product introduction, introducing new product into the market, R and D expenditure and focus, etcetera. So, this aspect of it is what we call the Management Control. We say that fine, I want to produce 10,000 cars. So then, the production department will come and say, well, I need 2 more assembly lines. Then, I will say fine here is excusing that money or using that resource build the new 2 lines. And, somebody comes and says you want to produce 20,000 cars, I am from the purchase department, the current engine supplier can only give us 8,000 engines. So, your 20,000 production is not going to happen. You need to change the supplier because the current supplier is not able to do that or you need to introduce a new supplier, etcetera. So, this kind of decision making what you call the Management Control. Instead of the long term I will say that these are derived from broad policies or strategic decisions. So, I would say it is more of Tactical approach, its duration is usually less than 2 years.

3) Operational Control- The Operational Control are basically decisions related to the effectiveness of organizational actions. Monitoring product or service quality, assessing product-service needs, etcetera. So, these are the Operational, typically you know, the focus is get things done in the appropriate fashion.

So, this is kind of the shorter term. It is like 1 week to less than 6 months, something like this. Different organizations will have different time length, this is just rule of terms for you.

4) Operational Performance- This is the day-to-day decisions made in functional units by managers in accordance with strategic plan. Also, this involves functional tactics, operational activities, etcetera. The duration is within 24 hours. So, every day whether it is production, whether it is inventory, whether it is sales, service, maintenance, the managers make decisions to get day-to-day things done. But those decisions are not taken in random, they are taken in such a way that it is in alliance or it is in accordance with the strategic plan or what we call the main broad policies or that is already established the long-term vision of the organization and that is the Operational Performance aspect of it. So, in all these 4 aspects, Decision Support System finds important usage.

Now, let us talk about the Organization or the Business Decision Situations or Business Decision Problems. We have already discussed this in many places and this is where we will talk about the 2 keywords that I already mentioned in the class earlier.

1) Structured- So, in many ways people discuss it, I will give it in some few words in my own. So, it can be described in numbers or specified in terms of numerical objectives. You can either describe it in terms of numbers or specified in terms of numerical objectives where specific computational techniques may be available to find an optimal solution. So, in broader sense you can specify this problem, the decision situation in numbers or you can clearly state in the form of numerical objectives and because of that them exist specific computational techniques that if you apply the technique on the numerical or the numbers you can find an optimal solution, that is the one simple way of thinking about Structured Problem.

2) Now, let me talk about the second part, I call it Ill Structured or Unstructured Problems. We also discuss what you call Semi Structured, etcetera. We will discuss on get on to this one but this is the other end of the spectrum. And, there are many definitions of this but the ways you can think about it is, objectives are hard to quantify, usually not possible to develop a model for the situation or the problem, require managers to use more creativity and subjective judgment to find a solution. So, this is the Ill Structured or Unstructured Problem, where you do not have the objectives, it is not easily quantifiable. The model development, trying to create model is, again as I said, abstraction of the system. And, a model is not possible. Developing the model is almost infeasible or difficult. And, managers depending more on their creativity and subjective judgement apply

their knowledge that how to find the solution to this problem, rather than depending on a specifically well-known computational technique to do this. So, such problems are where the Decision Support System comes into picture.

- So, the key thing is can be supported by computerized systems, that is a big thing.
  o But the support is limited to information presentation, summaries and analysis support rather than finding an optimal solution. This is the interesting part of this. This kind of unstructured problems can be very well supported by computerized system. But, do not expect the computer to give you the optimal solution, that is not the goal here. But the support that the computer gives will be limited to presenting you the information relevant to this. It will also give you summaries and it will also give you analysis support, what if analysis, which is one, what is one, that kind of things. But, less focused on finding the optimal solution and supporting you with things so that you can use your creativity and subjective judgment to the manager.

So, the aim to promote high quality subjective judgment and creativity. So, by providing the support by the computerized system, you are not just promoting the creativity and subjective, you are trying to ensure the high quality of the processes what you are trying to end. So, this is how the DSS becomes relevant to Business Organizations. That is why we usually say our course is more focused on Ill Structured or Unstructured Problems.

Now, let us talk about the support that you can get to different decision situations. And, I like to use a simple diagram to explain this. Let us take what you call non-routine decisions and you have what you call Routine and Recurring decisions.

So, this axis is the type of decision. This is your y axis and x axis, let us take two aspects. It is the Structured and the Unstructured or Ill Structured, here we are taking the situation. If we use this, when we create a continuum like this or a rectangle representing this. This is the Unstructured. Somewhere here, you can think about the middle is the Semi-structured, it is a mix of both.

You can say that it is somewhere here you have the DSS comes into picture in the industry, somewhere in this quadrant maybe little bit more towards somewhat like this, some aspects of the Routine. Less to the Structured side, more to the Unstructured Semi-structured. And, it can vary between more Routine-Recurring and some of the non-routine aspects. So, this is the one way to visualize how the DSS acts in business systems.

Now, we also need to know a decision situation and what are the main Elements, what are the situation. And, I usually say 5 aspects related to this. Few of them everybody knows, some of them you do not really know.

1) Goals
2) relevant alternatives
3) process of ranking alternatives. You have more than one alternative, which alternative is your first choice, which is your second choice, which is your third choice, that kind of things.
4) decision environment
5) decision maker

While it can bring in a process for the goals, relevant alternatives or identifying relevant alternatives and process of ranking alternatives, you can do this, you can have some semblance of processes or there exists some approaches to accomplish.

There is goal formulation approaches, how do you identify alternatives, how do you analyze alternatives, how do you rank, there are methods and approaches associated with this, whereas these two, the decision environment and decision makers, are usually organizational specific. It is very difficult for you to move this from one organization to another.

Hence, that is the reason why it is very difficult to have one software (DSS software) that fits organizations. If that is true, SAP would have been solved all these problems, but the companies who have gone bankrupt by implementing SAP is far more than the companies who has become successful. That is because it is very difficult to translate the decision environment and the decision makers at this point.

Let us discuss decision environment and decision makers quickly because these are the two important aspects which are relevant. So, I would say decision environment has two categories broadly for from a business standpoint.

1) Internal- The internal will have the major factors include. One of the major one is:
   - People- You have many people in an organization. So, people includes their goals, experiences, capabilities and commitment. The people come with different goals, they come with different experiences, they are freshers to 40 year experience people, they have different capabilities and different people have different commitments to the organization. People that are dedicatedly committed to the organization and people who are typically union leaders

who come there for striking. So, the commitment level varies from many people.

- Functional units- This includes the technological characteristics or capabilities, the independence, how independent is this, how interdependent and existing ongoing conflicts among units. As I said earlier, the production people cannot see eye-to-eye with HR and the marketing people does not like the sales people. These are all kind of examples of existing conflicts. So. each functional unit of an organization have different aspects.

- Organization factors- These include goals and objectives. Each organization will have its own specific goals and objectives, processes and procedures, you can say practices also at this point, nature of product or service, these are all changes. For example, let us say Tata not the commercial one, the small Tata motors, they make Safari, Harrier, etcetera, and same family within Tata is Jaguar and Land Rover who makes completely different products, and the nature and the clientele of the product is different.

Hence, the way that production environment is completely different compared to the other part. So, these aspects, the people, functional units, organization factors etc. are all internal, and usually these are specific to an organization, that is the environment.

2)   External- there are major factors that include customers, suppliers, competitors, socio-political issues, technological issues etc.

So, a combination of all these things, both the internal and the external factors, each organization has somewhat mostly unique combination which is very difficult to replicate. Hence, usually the environment within which you make the decision in one organization because the environment changes the decision that was successful in one organization may not be successful or deductive translatable in the second organization.

Let us talk about the second aspect which is called decision makers, the people who are responsible for making the decision. And, before we discuss the decision makers, we need to think about or we need to understand the word which is called,

- Scope of the decision
  - ➢ So, for this course it is very simple, it refers to who and what the decision will affect. If you make a decision, who will get affected by the decision and what will that affect be. Who and what that decision will affect, is the what we call scope?

- The scope often determines what level of management should be responsible for making the decision. So, if it is something that the everybody in the organization will get affected, it is usually better that the board or the CEO or the top management takes those decisions.

Anyway, so, with this, scope cleared out, we have 3 types of DSS users. DSS is, because we are now talking about the unstructured problem and making decisions within this. So, based on the decision makers, it is applicable to across the whole spectrum of the decision scope. There is fourth one also, I will add that at the end but generally accepted are 3 types.

1) Hands-off DSS user- It typically reads reports but does not directly use the DSS. The DSS will give you a report, you will take the report, take a read of it, But, I do not want to do anything with the DSS. I will read the report and that is it. So, that is hands-off.
2) Requester DSS user- It utilizes an intermediary to use the DSS.

So, the first type, the hands-off users, will only read the reports and will not do anything out of it, whereas the requester will actually use an intermediary. So, that means they will frame the questions, interprets the results and then make the decisions.

So, hands-off users may read and it may or may not influence the decision making, whereas a requester DSS will frame the question, interpret the results, read the reports and will make the decision and then, will use an intermediary to interact with the DSS.

3) Hands-on DSS- This is direct online access to the DSS. This person is typically comfortable dealing with the DSS, and they will do whatever is required as part of the DSS, no questions asked.
4) +4- This is the new one that we will talk about. We call it Renaissance decision maker. They are more of hands-on users. It is upgraded version of hands-on users. Why it is upgraded?
    ➢ Because they are comfortable with the database and modelling.
    ➢ Second part is, they can use intermediaries when appropriate. When they find it is appropriate and they find like an intermediary is required. They can build their own models and even small DSS. So, the renaissance user or DSS is the person who is a hands-on user, but he is far more comfortable than a typical hands-on user. A hands-on user limits themselves to the functionalities of the DSS. These people can go little bit beyond and they can enhance the DSS. So, this fourth type, after you see some point of time in an organization after people start dealing with the DSS or decision making or Decision Support

System, some of them upgrade themselves to the DSS user, who later becomes and champions, such kind of endeavors across the organization.

So now, the next part of this is, what we are going to talk about, the General Decision Process Model. And, how does the decision typically happen and how is the decisions getting made and that aspects of it. What we will do? We will talk about this General Decision Process Model quickly, and then, from there in the next class, we will stop here after this slide and then, we will continue in the remaining class and we will elaborate on this model.

So, the first step of the decision process is defining the problem. There are many people who proposed this, there are many iterations of this, many versions of this. This is kind of like the broadest thing that you can think about.

Then, this is one step which is kind of interesting step. We can say decide who should decide. Who is the decision-making authority is thing, something that we need to decide? Who will make the decision, that is the next step after this, decide who will decide?

Then, next thing is collected information, there we go. Once you collect the information, then you need to do are, we can say identify and evaluate alternatives and this is a back and forth step, it goes both ways. You identify and evaluate and sometimes you require to collect alternatives and you loop around here and once you are reached a successful level, then you decide, you make the decision. Once you make the decision, then the next step you have to do is, implement or enforce the decision in the organization.

Then, follow-up assessment, you cannot just implement and forget about it you need to assess the effectiveness of the decision, and then, from there you go back to this step and you may need redefinition. Because if everything is good or you may stop here also, if it is not good you may need a redefinition, you may go back to the problem and go through this cycle or go through this decision-making process model.

So, there is a may or may not, there are two options in front of you at this point. So, this is the broader aspect of the Decision Process Model or the Business Decision Process and, we will elaborate on this, the different approaches that are followed. But this is the broad framework of it and we will discuss more details in the coming class.

So, thank you for your patient listening. We will soon come back with the next follow up. Thank you.