Computer Aided Decision Systems – Industrial Practices Using Big Analytics

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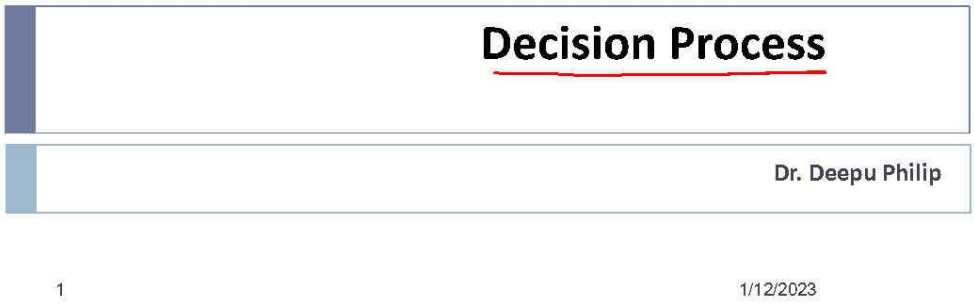
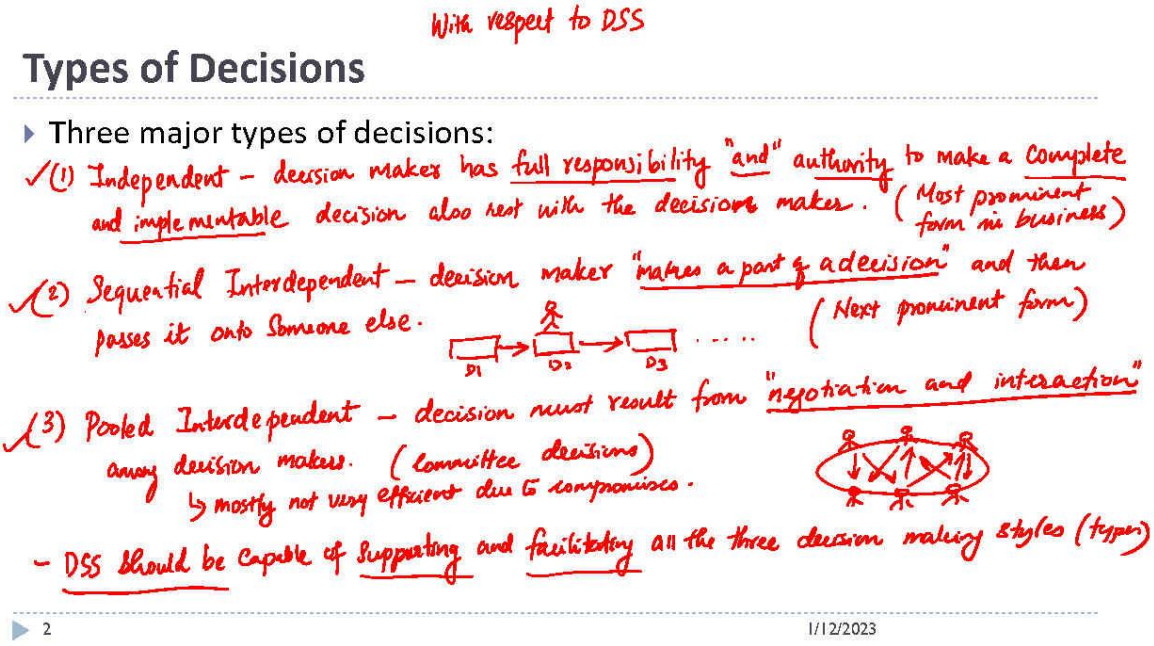
Lecture 4
Decision Process

This chapter is on the base decision support systems for management. And, as we have gone through the details of decision support system.



Now, we are trying to get into the decision process, and then, we will look into each components of the decision support system.

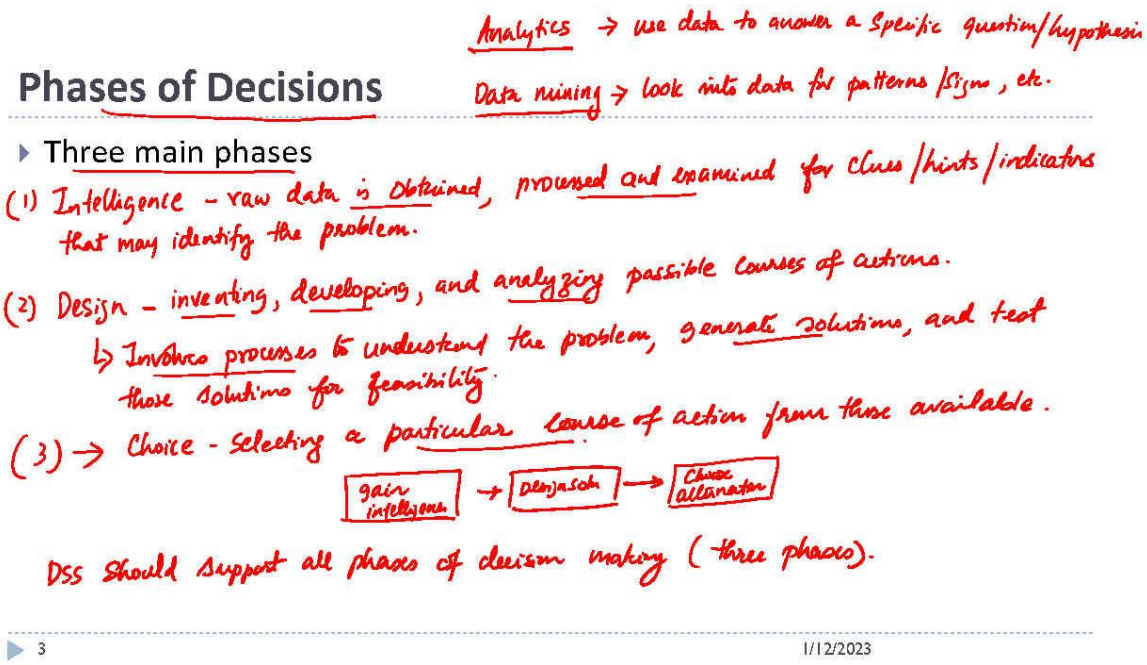


First, we will talk about the three major types of decisions that we will be dealing with as part of the decision support system:

1) Independent Decision: The idea here of an independent decision is the decision maker, whether it is a he or she, has full responsibility of the decision in complete sense. And authority to make a complete and implementable decision also rest with the decision maker. In business, most of the time, this independent decision is the most prominent form of decision making.
2) Sequential Interdependent Decision: The logic here is that the decision maker, whether it is a he or she, makes a part of the decision, and then, passes it onto someone else. So, it is like decision 1, decision 2, decision 3, etc. Let us say, the person whom we are talking about is making the decision 2. So, somebody else made the decision, passed onto decision 2. You make the decision and then, pass onto decision 3. Somebody else will make the rest of the decision, and this chain continues. And, this is the next prominent form in business.
3) Pooled Interdependent Decision: Here the decision must result from negotiation and interaction among decision makers. Most of the time, this type of decision is what we also call as Committee decisions. The way to think about it is, you have a round table, and you have people sitting around the table, or the decision makers sitting around the table and they negotiate an interact among each other, and then, make the decision. Lot of the time, these kind of decisions are also known as, mostly not very efficient due to

compromises. In a committee kind of a setup, you have to make compromises, you have to talk to people, you have to make amendments, you might have to agree with somebody else's vision, thought process, etc.

Hence, you might not make the best decision. You might make a compromise decision. So, what should DSS do? The important thing is, the DSS should be capable of supporting. So, the capability of the DSS should be supporting and facilitating all the three decision making styles or types. Only then, you can call it as the decision support system. Basically, it supports all sorts of business decision functions.

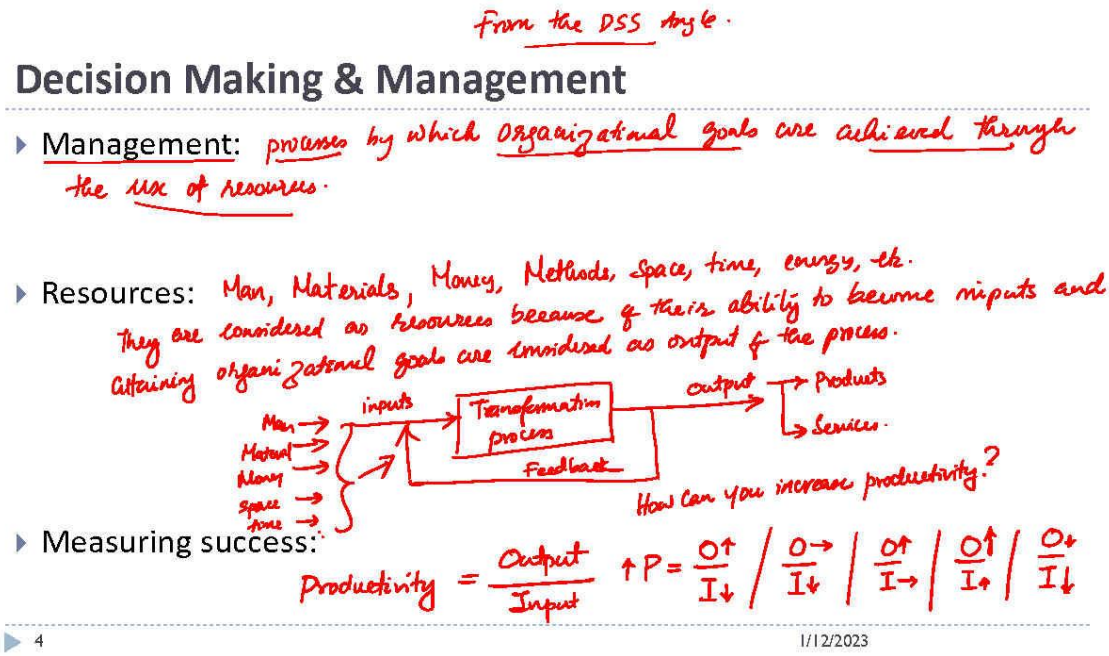


Now, we will talk about the phases of decision. We have three main phases of decision:

1) Intelligence: Here, raw data is obtained, and then, processed and examined for clues, hints, or indicators that may identify the problem. And, there is something also known as data mining. When you look into data for patterns or signs, etc. Then, you take the data, and you are just looking into finding different patterns and stuff like that. Then, that is typically what you call as data mining. So, you have no specific thing in mind, you are just basically looking into it. Whereas, in analytics, we use data to answer a specific question or hypothesis.
2) Design: You are inventing, developing and analyzing possible courses of actions. You develop your own approach, invent your own approach, or you may develop your own

approach, or you may analyze data and come up with new portfolio approaches. This has two important aspects you need to think about.

a) It involves various processes that help you to understand the problem, generate the solutions, and test the solutions for feasibility.
b) Once you generate solutions, the next part is, choice. You have to make a choice, which is the selecting or selection of a particular course of action from those available.
c) Then you choose an alternative.



Now, let us talk about decision making and management. There are many other definitions available, but we are defining it from the DSS standpoint:

1) The first phrase we are going to define as part of it is management. What is management? There are so many definitions, but for us, the working definition is, processes by which organizational goals are achieved through the use of resources.
2) How do you achieve organizational goals? You are achieving organizational goals through the use of resources. So, second phase is resources.

   How do you use the resources? There are a set of processes by which it allows you to use the resources.

What are these resources? You can think about it as per manpower, materials, money, methods or processes, so then you can think about it as space, time, energy, etc. These are all resources.

Why are they resources? They are considered as resources because of their ability to become inputs, and attaining organizational goals are considered as output of the process.

Sometimes, from the output to the input, we tend to have feedback. So, in this case, the inputs tend to be man, materials, money, space, time, energy, etc. And the output can be broadly summarized into two, we can think about it as, products or services.

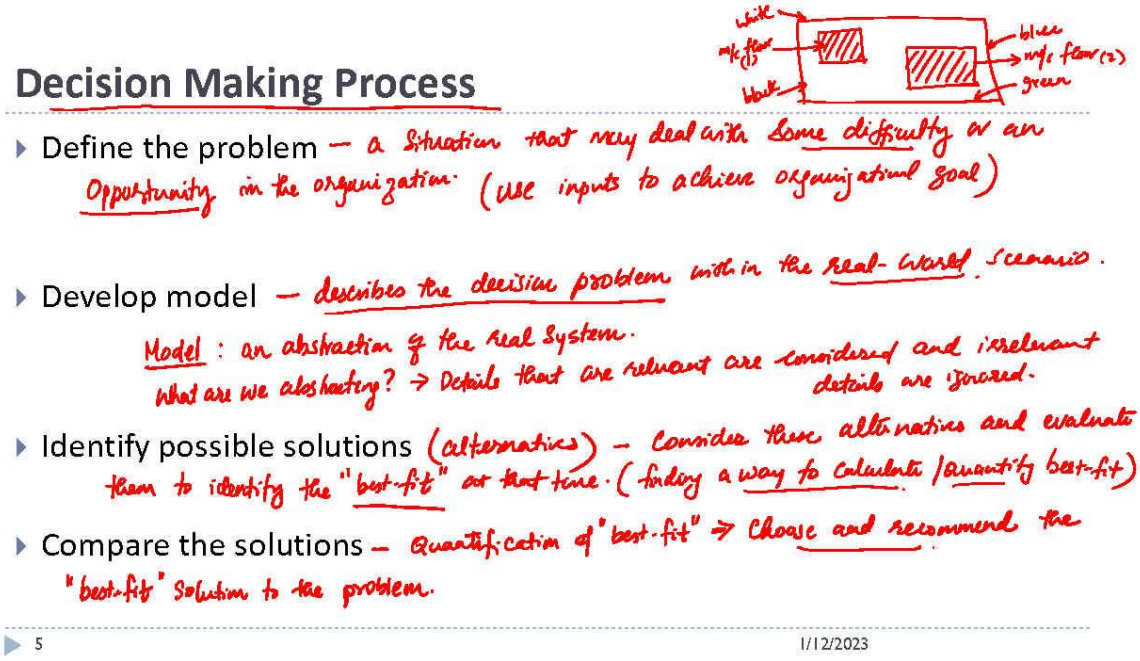
So, we talk about Maruti Suzuki, then their organization goal is to make cars. So, the product will be car. Or if you talk to Infosys as a software company, they will be providing software services. So, when you have tangible products in this transformation process, sometimes people call it as manufacturing. When you have a service like Infosys, then that transformation process is called as operations. So, the resources are the critical part that actually goes into the processes as inputs.

3) The third one is, how do you measure success? Most of the time, you measure success by a term called productivity. Productivity is the ratio of output over input.

   How many ways can you improve productivity? There are five ways you can think about doing it:

   a) If you call productivity is P, if you want to increase it, then the option in front of you is, output over input. So, you increase the output, decrease the input, this is one option.
   b) The second option is, you have an output, you have an input, you maintain the same output, reduce the input, this is another way of increasing productivity.
   c) You maintain the same level of input while increasing the output. This is the third option.
   d) Then the fourth option is, you can slightly increase the input, but at the same time, slight increase the output much drastically, then you can increase the output.

e) And then, the last option is reverse of this, which is slightly decrease the output, but large decrease in input.



Now, we will talk about the decision making process:

1) Define the problem: It means the situation that may deal with some difficulty or an opportunity in the organization. So, once you find that there is some difficulty, or there is an opportunity, then you want to exploit that, and then you want to use it in this way. Then, once you identify this, you want to use inputs to achieve organizational goals. So, if you are producing cars, produce better cars, more cars, make more money. If you are doing services, provide better services, provide service to more people, make more money, that kind of thing.
2) Development of the model: It describes the decision problem within the real world scenario. So, whatever is the current situation, or the organizational situation that you see, within that context can you describe the decision problem, that is what developing the model means. Or another way to think about it is a model in our class. For this course, we call it as, model is an abstraction of the real system.

   So, what are you abstracting? Details that are relevant. Relevant details are considered, and irrelevant details are ignored.

> Let us say, you have to make a decision of where to place. We will take an example here. There is a factory building, and one wall is painted green, the second wall is painted blue, the third one is painted white, and the last one is painted black.

In one place, there is machine flooring, and there is also another place where you have machine flooring. If you have to place a very heavy machine, you may not look at, what is the colour of the wall. You may decide where you have machine flooring, and you will decide whether to place it in the machine floor one or machine floor two, because the machine has heavy weight and you do not want the floor to break.

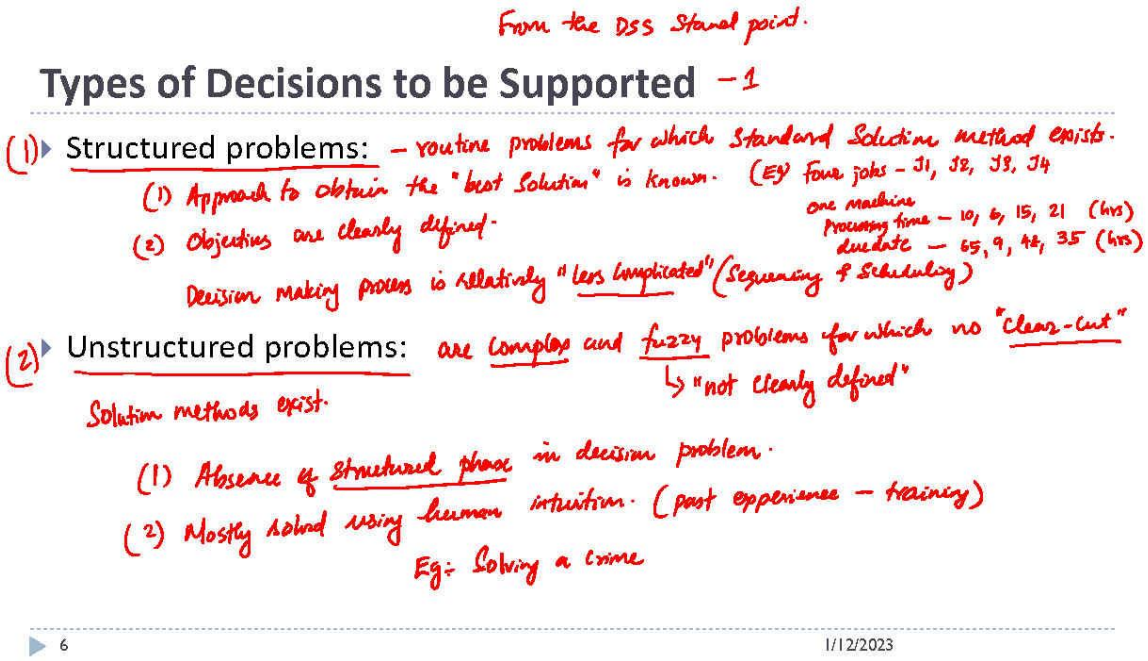
When you are abstracting this, you would only abstract the details of the square footage of the machine floor, and where the machine floor is located, and where, if you place this machine, you can still save a considerable amount of machine floor, and you will find that place and put the machine, and you may not look into what you call as the colour of the wall, at the time.

That is what the abstract is. So, the colour of the wall is abstracted out and the rest of the details are maintained. Then comes identification of possible solution, the third step in the decision making process. What does it entail when you say identify possible solution? Typically there is not one, but many alternatives available. So, consider these alternatives, and evaluate them to identify the “best fit” at that time.

The importance is, you are making a decision in present. You analyze and decide, which is the “best fit” within that time period, at the current time and you make the decision, on the current time. You may not be able to make the optimal decision, but whatever data you have, you decide to make the best fit at this time period.

Then comes the comparison of the solutions, the last part. Comparison of the solutions is, quantification of “best fit. Or another way to think about it is, what do we do here? Choose and recommend, we are making a choice, and we are making a recommendation, recommend the “best fit” solution to the problem. At this point, you are finding a way to calculate or quantify “best fit”.

In the previous step, you are finding a way, you are coming up with equations or whatever it is to quantify the “best fit”. In this case, you do the quantification process, and from then you make the choice and recommendation for the “best fit” solution to that particular problem.



We now move to the type of decisions that are to be supported by the DSS. The first one is a structured problem, we mentioned this in an another way.

We call it as routine problems. They are very routine problems, for which standard solution methods exists. Here, there are two parts. First, the approach to obtain the best solution is known. And, second one objectives are clearly defined. Let us say, for example, you have four jobs.

We call it as, J1, J2, J3, J4. And you have one machine. And each job has its processing time and due date or promised delivery date. And the processing time, let us call it as, 10, 6, 15, 21, these are in hours. And the promised delivery date, the due dates are 65, 9, 48, 35 respectively.

Which means, the Job 1 will take 10 hours to process. And it is due, we have to deliver that in next 65 hours. Job 2 take 6 hours to process, and you have 9 hours to deliver it. Job 3 takes 15 hours to process, and 48 hours to deliver it. Job 4 takes 21 hours to process, and 35 hours to deliver it. So now, which job should be done when? That is a standard question that a lot of people try. This is called as sequencing and scheduling.

You can talk about the earliest due date, I want to deliver the job in such a way that none of the jobs are late. So, the objective is clearly defined, and the approach to find the best solution, given the condition is also known to you. Take the job which has the earliest due date, and keep on processing them, so that, you have minimized the due dates.

The decision making process is relatively less complicated. It is reasonably easy.

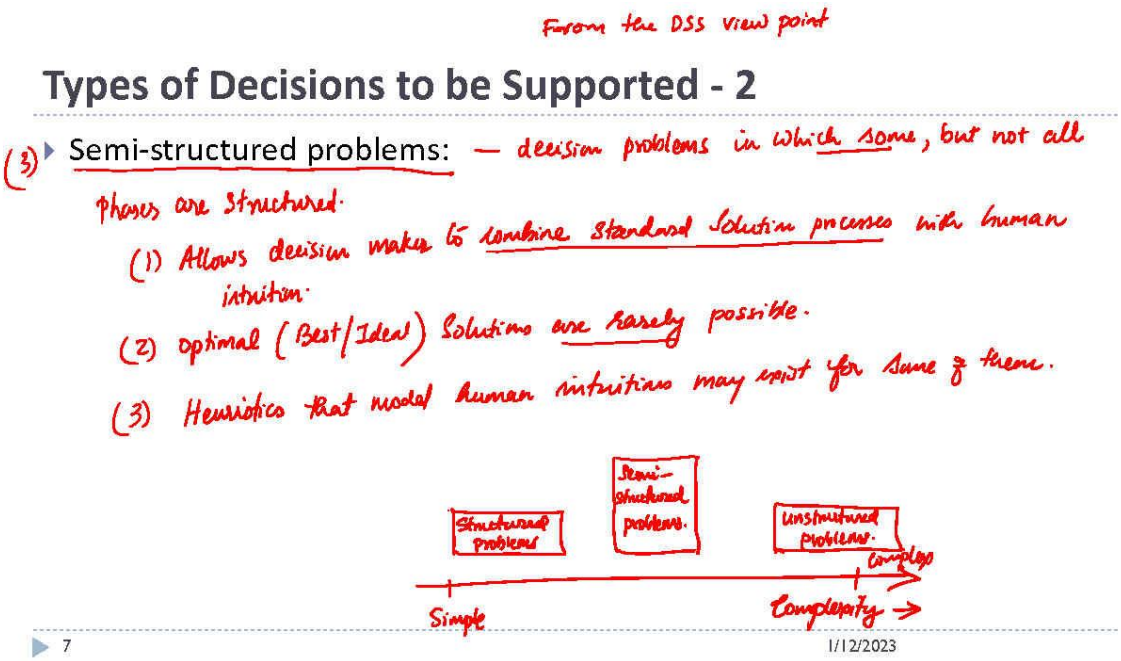
We will go to the second part, which we call as unstructured problem. So, these are, complex and fuzzy problems, for which no clear cut, solution methods exist.

These problems are complex, number one, and fuzzy. Fuzzy in another way, you can think about as, not clearly defined. So, the number one aspect of this is, there is an absence of structured phase in decision problem. There is an absence of structured phase that causes this problem to be not clearly defined.

And, second one is mostly solved using human intuition. So, your decision maker's intuition, or what we call as past experience, or you can think about it as, or maybe training etc. These all comes into handy, when you try to solve these kind of unstructured problems. And unstructured problems are like a classic example. A simple example of this is solving a crime scene, each crime is a separate problem.

And, the police or the detective does not know who committed the crime, looks for clues, identify the clues, his prior experience, training, previous lessons learned from solving similar crimes, etc comes into picture, his hunch, intuition, etc comes into picture, observations comes into picture. From there, he creates, what he calls a mental model, where this is what might have happened. And from there this is what has happened, this might be the guy, or this might be the type of crime, and who are the people who do the crime, look for other clues, and so, sometimes you may catch the criminals, sometimes you may not catch a criminal.

Let us say, you try to solve a theft today, or the person solved that today successfully, does not mean that another theft tomorrow will be solved successfully. Because each time, one theft is completely different from the other theft, and it will have its own fuzzy elements to it, fuzzy again is not the fuzzy logic, it is more about the not very clearly defined part of it.



Then, we move to the next one, which is the decisions to be supported, again from the DSS viewpoint. And the third type is, what we call as semi structured problem. So, this is an interesting thing. And sometimes, a lot of the time, people are happy in business to come across semi structured problems, purely because these are decision problems in which some but not all phases are structured.

We went through the three phases of decision making. But some phases, not all phases, some phases are structured. So, it allows you to do again, two important points, allows decision maker to combine standard solution processes with human intuition. You have the capability to combine Standard Solution processes with that of the human intuition, because there is some structure phase, and not all phases are structured.

So, wherever the structured phase is there, so, you use standard processes, and wherever there is unstructured, you use human intuition. The second part of it is optimal solutions. We will call it as the best or ideal. Optimal solutions are rarely possible. It is not that they are not available, but it is very rare, very, very rare that you would be able to get the optimal solution.

This kind of approach, where you combine some standard solution process with human intuition. So that says that heuristics, that model human intuition may exist for some of them. You may have a heuristic or a computer may be able to mimic how the human is making the decision and etc.

But, that does not mean that you are going to get the “best fit” or optimal solution for that particular problem. So, the idea logic here is that the DSS, it has to support the structured problem, which are reasonably simplistic in nature, less complicated, and then you have to support the unstructured problems, which are the most complex one in nature, and then there is the in stuff in between, the semi structured problem, the intermediate.

So, if you think about it, if you take x axis as complexity you are moving towards complex. The complexity increases as you move to the right. So then, you have structured problems in one end and then you have really unstructured problems in the other end.

Somewhere in between, is the semi structured problems. With this, we come to the conclusion of this decision, and the type of decision, we are not talking much about rational decisions, and those kind of things. That we will talk, when we come into the model based management systems and etc.

But, for the time being, from the background of the decision making and the decision support system. These are the major aspects of decision processes that we need to learn and understand, as part of this course.