Course on E-Business
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Module No 02
Lecture 09: Decision Support For The Management

Welcome back. In today's lecture, we are going to discuss about the decision support for the management through the information system. Now look, last class, we discussed about different kinds of information systems and every time we were talking about how how it can aid in management decision-making. Now let us try to understand what is this decision and how exactly the decision is carried out and how information system really helps.

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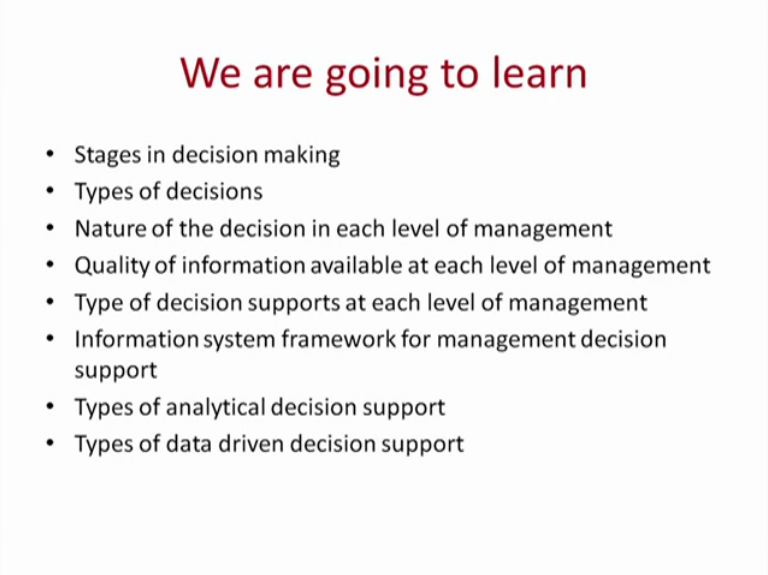

So in this lecture, basically we are going to learn about the stages in decision-making, various types of decision situations, nature of decisions in each level of management, quality of information available at each level of management, type of decision support at each level of management, information systems framework for management decision support, type of analytical decision support and different types of data driven decision support.

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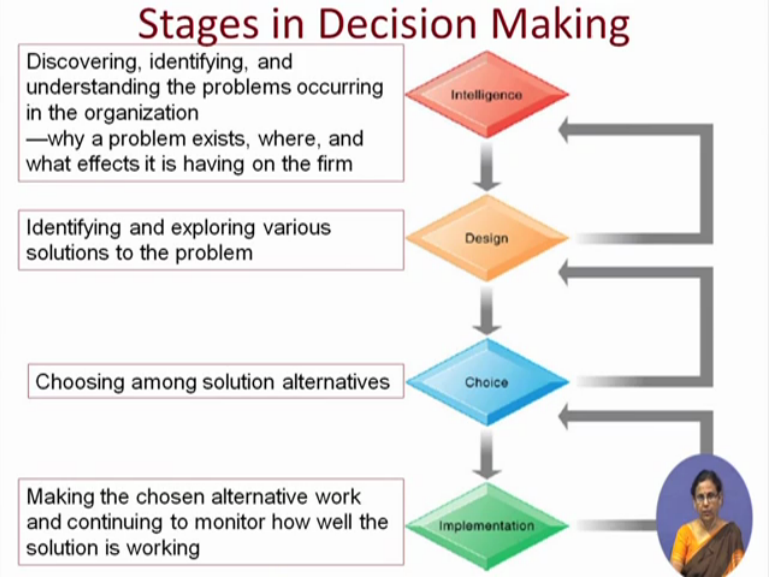

So if you look at various stages of decision-making, in general whatever may be the decision-making situation, in fact it has 4 stages. 1st one is intelligence, 2nd one is design, 3rd one is choice and 4th one is implementation. In this intelligence stage, one discovers the problems, identifies it based on certain facts, it understands the problem it understands that the problem is actually occurring in the organisation and then try to analyse why this problem exists and where it exists and how it affects the firm.

And once this problem is identified, then the solution is searched for. So during this solution search process, various types of approaches are adopted and the best approach is finally selected. And once you have those various solution approaches during this choice stage, you choose for the appropriate solution. Once you find out the appropriate solution, you use the solution to get rid of the problem, to help alleviating the problem and during this process, you see how exactly your solution is improving the situation. And in fact, this stages that I was talking about, this intelligence, design, choice and implementation, they are not sequential processes.

In fact, they are iterative and from one stage, you can go to the previous stage but whatever may be the decision-making problem, everywhere these 4 stages are followed.

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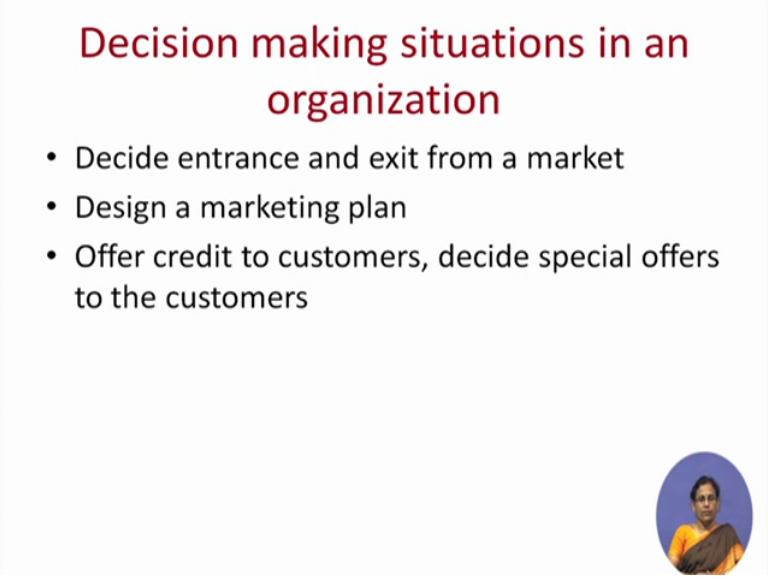

Now consider 3 decision-making situations. 1st one is, you decide whether you should enter and exit from a particular market. All these things are related to the marketing. And the 2nd one is about designing a marketing plan. And the 3rd one is about whether to offer credit to the customer or not. If you look at this, then the 1st problem that we are looking at deciding whether to enter the market or exit from a particular market is a decision which is taken by the strategic level. Is there any definite procedure for taking this? No.

If, for example if a particular unit, a particular business unit is not being profitable, so how the company will know that it is not profitable? Looking at the past data, et cetera, it will be discovering this problem. Once this problem is discovered, again some market analysis will be done, then whether it is actually recession period, we should be staying and waiting or we should be actually exist in the market, so those decision are taken by the strategic level.

And if you can look at, there is no definite solution, predefined solution plan for such kind of decisions. The 2nd one is about, the 2nd problem that I was looking, talking is about designing a marketing plan. When the marketing plan will be designed? Once you are in certain market, that is in the strategic level, you decide that you are going to be in this going to play in this market, then only the marketing plan will be made.

So which means, the amount of uncertainty which was involved in these 1st one, that is deciding whether to enter into the market or exit from the market, that uncertainty is not there in this 2nd one, 2nd decision-making situation, that is designing a marketing plan. But it is still a problem. It is still a problem. The proper plan has to be made by the middle level management.

And if you look at this, here the various options, various let us say for example consider the advertising, whether which kind of advertisement media has to be given more priority and how much money they should put into which kind of advertising media, so these can decision-making involves certain kind of data analysis, certain kind of analytical model but it is not completely, it cannot be completely automated. Because again, there is no for every part of the distribution making, there is no fixed rule.

Then the 3rd kind of decision-making situation is to, we have two here, offering credit to the customers and deciding special offers to the customers. Look, these are quite, you know you can have certain kind of if then else rule. If such, such, such conditions happen, then you give credit to the customers. If prior to this, customer is creditworthy, you provide credit to the customers, under let us say special season, you provide some kind of offer to the customers and so on.

So you can say this is a very structured kind of decision. So this example clearly tells us that the decision though the decision-making process has to follow the same approach, you 1st analyse the problem, then find out the design alternative, then choose the alternative and so on.

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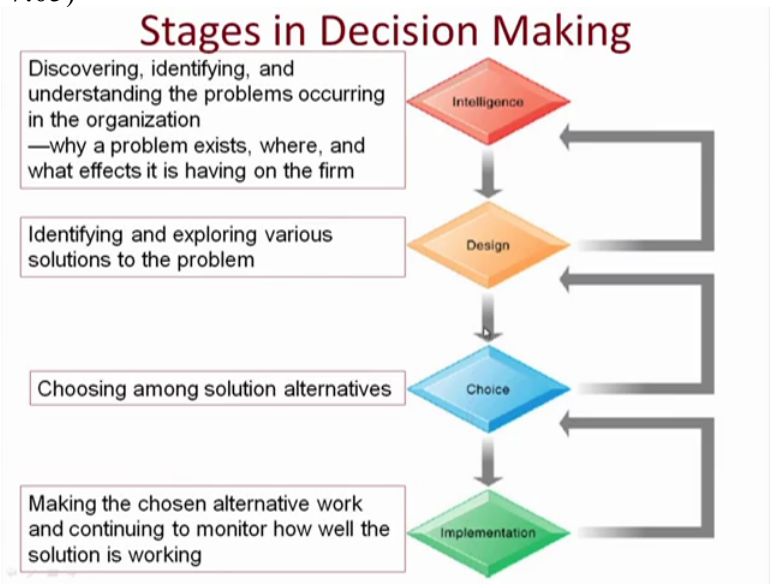

Actually even if the stages are same, these 4 stages, this intelligence, design, choice and implementation, even if those stages are same, all these 3 situations are, the decision-making situations are actually different. Some are very structured, some are not so.

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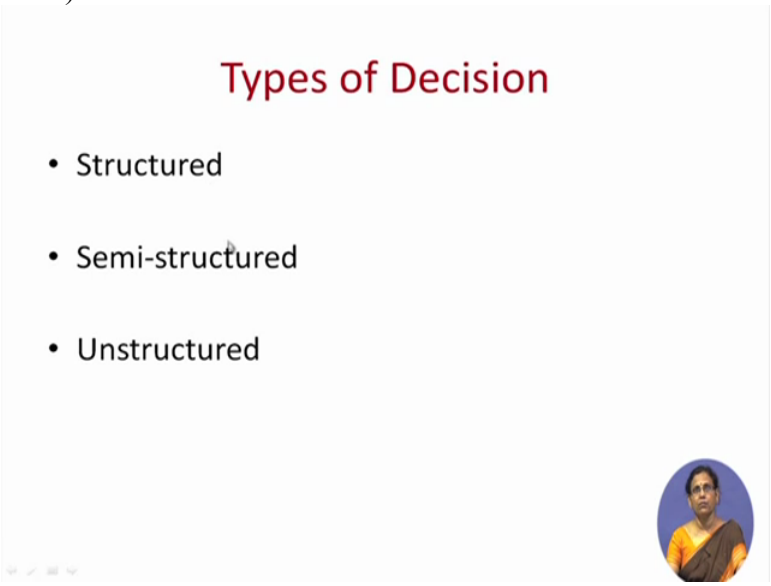

So based on this observation, we can say there are 3 kinds of decision-making situations. Some are very structured decisions, some are on semistructured decisions and some are unstructured decisions.

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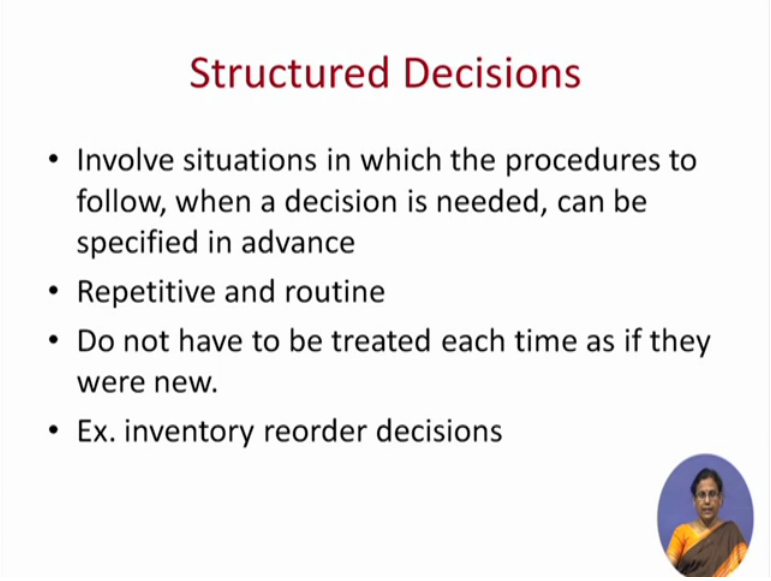

In case of structured decisions, it involves a situation in which the procedures are predefined and you know what procedure to follow. And before the decision-making situation arrives, the procedure can be prespecified and such kind of decision-making are repetitive and routine. They do not have to be, the solution process do not have to be, you do not have to think about the solution process everytime situation comes.

Everytime the situation comes, you follow the same procedure. The example include your inventory reorder decision. You know that you know about your inventory system and you know that one exactly, under what conditions, what what is the condition that has to be the has to happen when you put your next inventory decision.

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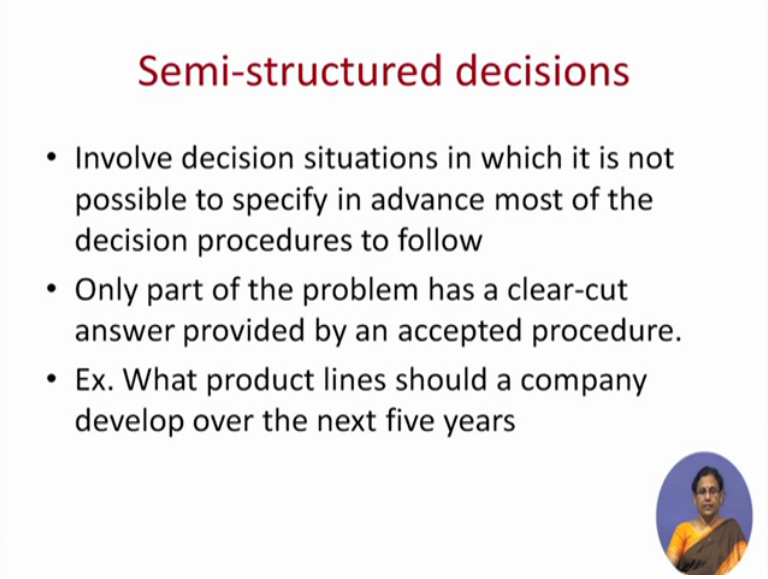

Next category of the structure of the decision-making situation are called semistructured decisions. So in the semistructured decision, you can say it involves certain a part of the decision making situation, there is a predefined procedure and for the other part it may not be. So which means, so for some part, you have a clear-cut answer, clear-cut procedure which provides you with the answer and the other part, you have to be taking based on your experience, you have to be intuitively taking the decision.

For example, what product lines should a company develop over the next 5 years? Of course, it is it can be a, there can be certain part which can be automated, you can have, you can build a optimisation model which will tell you that this is the product line, I mean the of course providing the appropriate parameters, it will tell you, this is the kind of product make you should be following in your next 5 years. But the parameters that you provide, you may not be actually knowledgeable about the parameter values itself.

So therefore what you will be doing? You will be doing a number of times you will be changing the parameters and see what exactly happened if the parameter values changed and appropriately, you take the decision. So partly it you can have build a automatic model for it but for the other parts, you when you are not sure that what exactly is going to be your parameter value and you adjust the parameters and you see, and there may be situations in which in the analytical model itself, you cannot even involve certain constraints.

So if if the situation comes like this, then you have to be for whatever part, you can actually build the model, you get the solution out of that and for remaining constraints, you, with your experience and your intelligence, you try to handle them.

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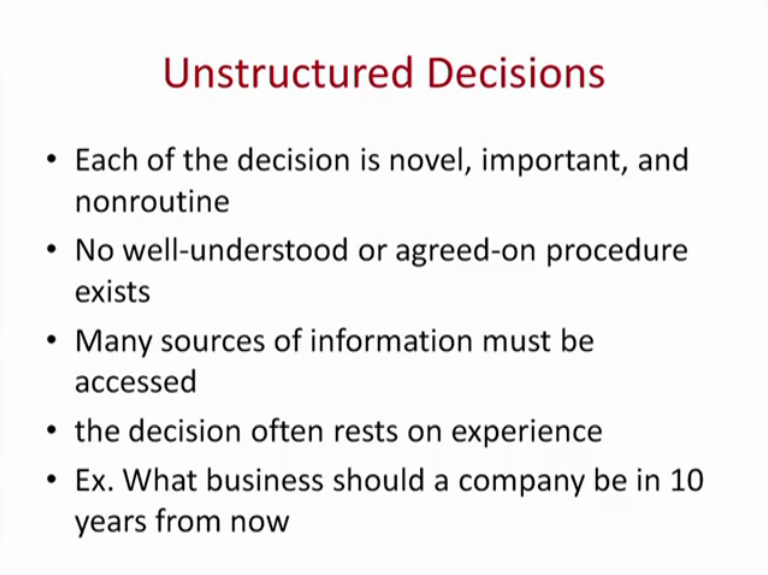

Then the 3rd one is actually unstructured decisions. So such decisions each time, such kind of decision-making problem comes in, it is actually a new situation. And it is highly nonroutine and it is highly important for the business. And there is no well understood or agreed upon procedures for solving such problems. And you actually need solutions from many sources. Not only from your transaction processing or your Management information systems but you need from external resources as well.

And besides this, your intuition plays a great role. Your experience and your intuition also plays a great role. For example, what business should a company be in 10 years from now? So this is a situation in which the decision there cannot be any procedure. You can use data from various sources but you do not have any procedure to let you know in what kind of business your company should be let us say in 10 years time from now.

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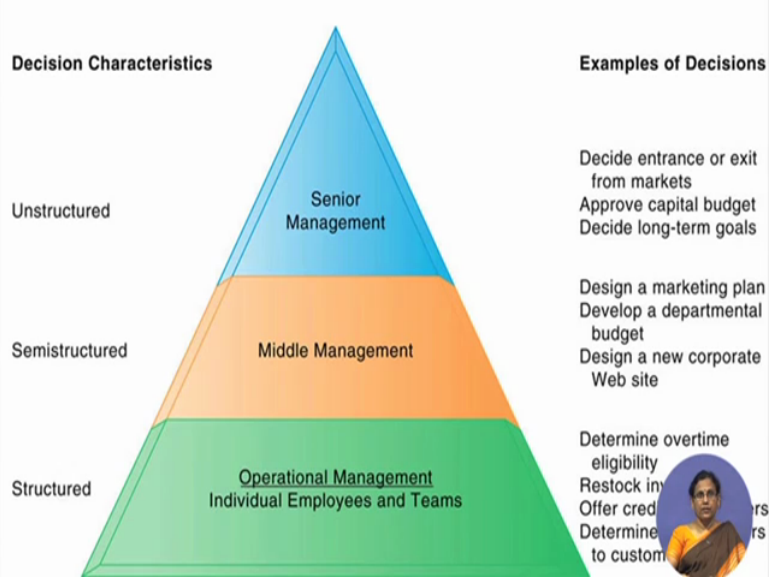

So again, we look at this management triangle. In fact, most of the decisions that is taken at the low level, that is your operational level are actually structured in this image. Middle level management, it is semistructured and in senior level management, it is unstructured. However , we do not say that this unstructured, there at operational level, there will not be any unstructured decision-making situation or a semistructured kind of decision-making situation.

But mostly at the senior level management, you have unstructured decision-making and middle level management, you have semistructured kind and in the lower level, you have very structured kind. Then there are few examples here, you can go through them. For example, we have already discussed about this, whether to decide whether to enter and exit a market, taking approving your capital budget, deciding long-term goals, those are your senior management problems.

Then in the middle management, the problems are, designing marketing plan, developing departmental budget, deciding a new corporate website and so on. At operational level, the various problems could be determining overtime eligibilities, stock, deciding restock policy, offering credit to customers, determining special offers, et cetera, can be at the lower level.

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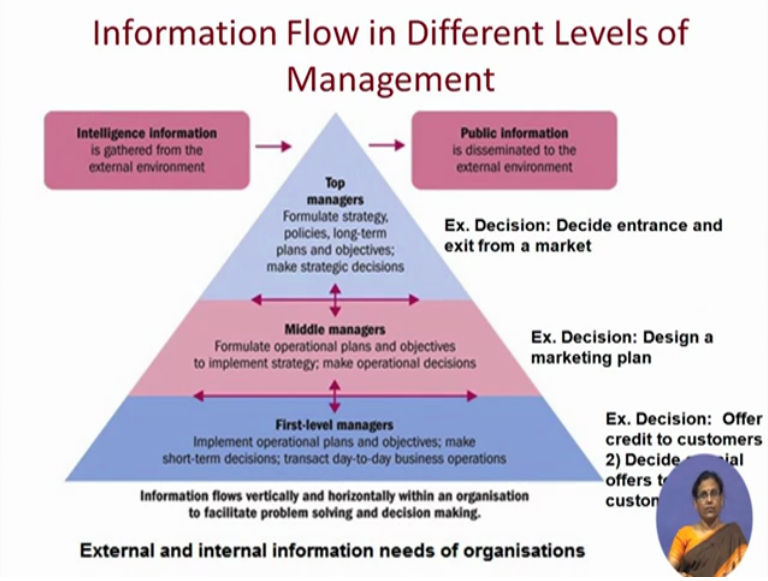

Now if you look at this decision-making situation, every decision making situation requires some kind of information. So the kind of information that is required for let us say whether you should be there, whether you should enter into the market or you should exit out of the market the 1st problem that we discussed. So in this case, the information not only comes from your internal sources but it comes from external sources.

So the top-level management when it decides certain strategies and makes policies and so on which are basically long-term in nature, it requires information going from lower level management to upper level, going from lower-level management to the upper level and then it also has data input from the external sources. Similarly, your it whenever it has to disseminate information, the information has again, has to go to the public from the top management.

But there is always a information flow within the organisation which goes from top to bottom and it goes in a horizontal manner as well. Okay? So the information flows vertically and horizontally within any organisation to facilitate the problem-solving and decision-making. Now, how does this information flow? This information basically flow through the information system while automating the business processes. What is the business process?

That we have already defined in one of the previous classes. The business process is, what is a business process? Business process is basically the workflow of the information, material and

money. And I have already told you that even material and money have their own information component which flows through the information system.

So this information when we look at this information within the organisation, in fact, the kind of information required at the top level and the kind of information required at the bottom level are totally different. Totally different by total different, we mean the nature of the information is different. When we consider this nature of the information or the quality of the information, quality of information has many parameters.

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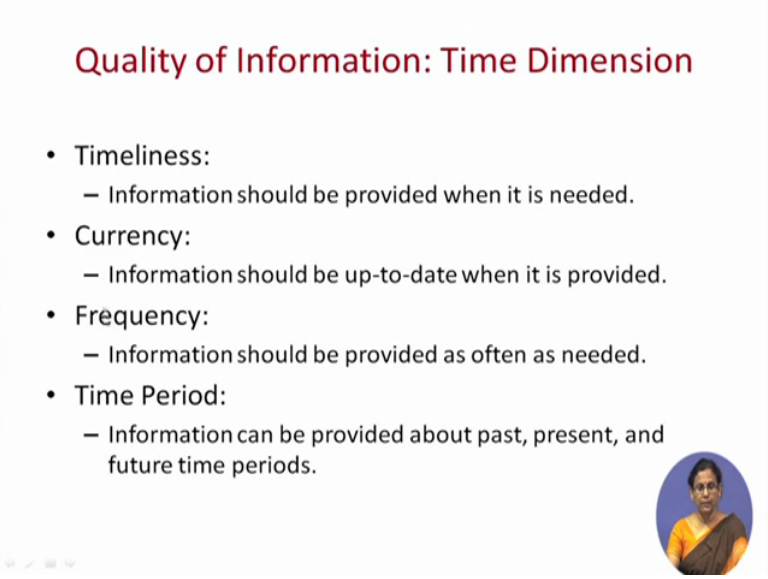

For example, it can have 3 broad dimensions. 1st dimension is time dimension. In the time dimension, it has many soft dimensions. 1st one is timeliness. Information should be provided when it is needed. The 2nd dimension is currency. Information should be up to date when it is provided. It should be current. Then, the 2nd one is frequency. The information should be provided as often as needed. Then the 3rd category, 3rd sub property is actually time period. The information can be provided about the past, present and future time period.

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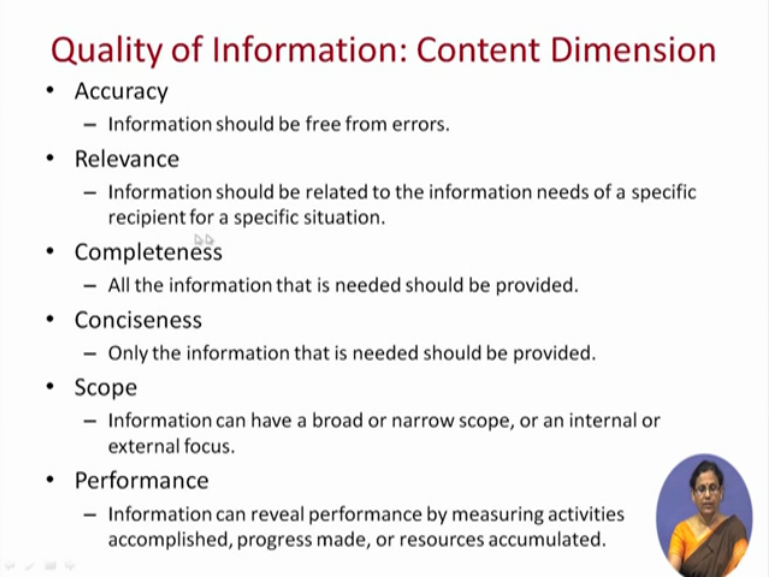

Then the 2nd dimension is your information content. So it has again many soft dimensions. 1st is accuracy. Information should be free from errors. 2nd one is available. Information should be related to the information needs of a specific recipient for a specific situation. 3rd one is completeness. All the information that is needed should be provided.

Then 4th one is it is concise. It has to be concise. Only the information that is needed should be provided. You should not overload a person with unnecessary information. For example, while talking about management information system, we were talking about the company should be, the managers should be provided with exception reports. When they are providing in general with a more descriptive report, the summary report, why exception report?

Because to reduce the information overload. So the report should be concise. The 4th one is actually the the information can have i mean the scope of the information. It can have broad or narrow scope or an internal, external focus. The scope should be decided. Next one is your performance. The information can reveal performance by measuring activities accomplished activities accomplished, progresses made, resources accumulated and so on . In fact here I would like to remind you that one of the earlier classes, I have told you that the key to wh when you try to automate the business processes, you need to improve the process.

This improving the process is or this business process reengineering involves those 6 Sigma DMAIC stages. And that time we discussed that this information system plays a great role whatever information is required for measuring the process comes from this information system. In fact, for using this information, various models can be made to judge whether a particular process is optimised or not and accordingly the improvement can be done or the process can be re-engineered.

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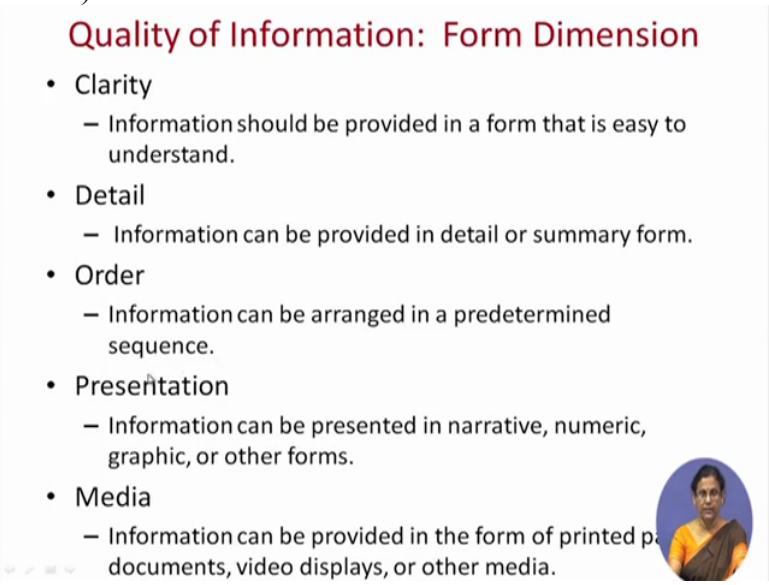

2nd dimension is form of the information. It has again many sub dimensions. 1st one is clarity. It should, the information that you according in the form of report or something, it should be clear and understandable. It should be detailed, I mean its detailing. For example, in the transaction level, you may require an extensive report. But at the middle management management level, you need to summarise the report.

So either it can clean a detailed form or it can be summary form. 3rd one is the order. The information can be arranged in a predetermined sequence. 4th one is how you will be presenting the information. So when we are talking about the descriptive analytics, if you remember, we are talking about how to present the information. How to present information?

Whether you should give the numeric value, whether you should be writing in words, whether you should be using graphics, whether you should be using some other form of presentation.

Then media, how should it be provided? Whether it be provided in a printed form, in video display, it should be in as a some kind of you know online form, you should be deciding that.

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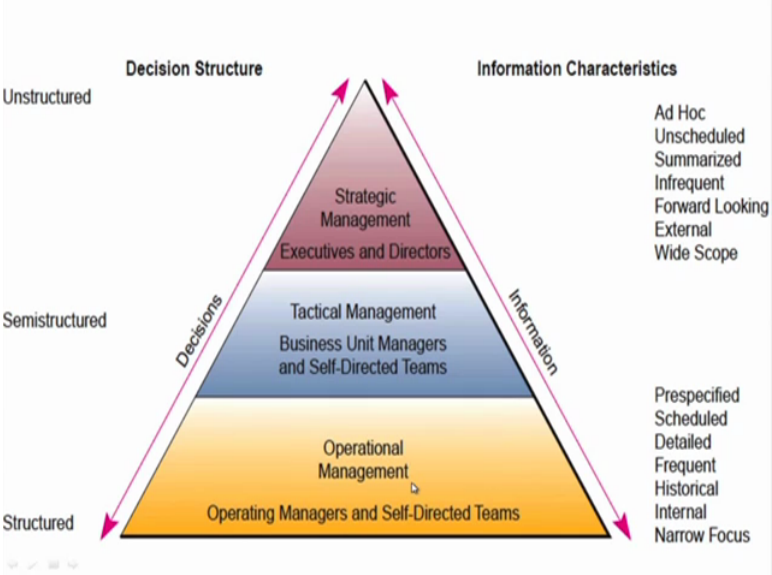

But whether it is depending on whether it is structured, semi-structured or unstructured, in this management triangle, the nature of the information actually varies. When at the lower level, the information is more pre-specified, it is scheduled, it is detailed, it is frequent, it is actually from the historical data, it is basically from the internal sources, it has a very narrow focus. As you go up in this triangle, it becomes more ad hoc, more unscheduled, it is more summarised, it is infrequent and it is horror looking. It has external sources, it gets the data from external sources as well and it has wider scope.

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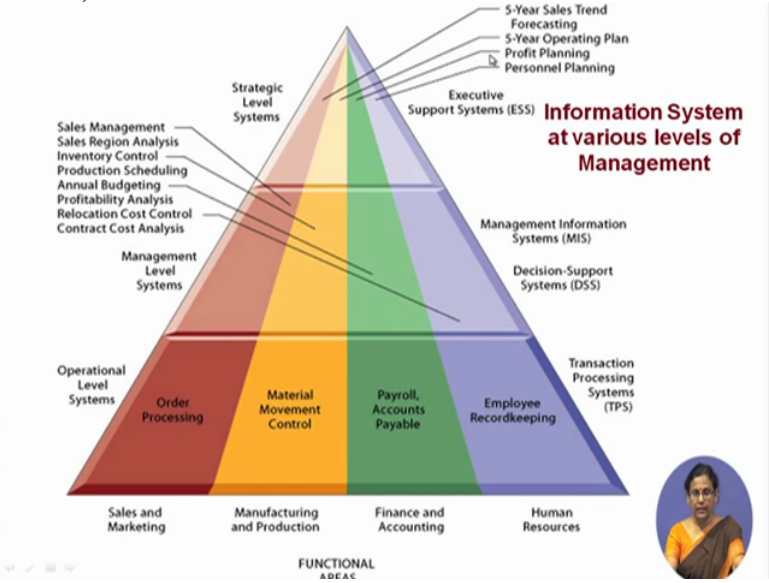

And accordingly, you make decisions at various levels and what are the systems to take decisions at various levels? For the operational level, you have transaction processing system, at the middle layer, you have this management information system and decision support system, at the top-level you have executive support system. And the kind of decision you can read from here and one thing we should mention that here that a company actually consists of internal it has 4 major subsystems.

Your i mean the these 4 major subsystems can belong to either sales, marketing, manufacturing, production, finance and accounting and human resources. And under this, many activities takes place. For example, a typical operational level activities are order processing, material movement, payroll and accounts payable, then employee recordkeeping, these are various activities under each of the resources and similarly, when it comes to midlle level management, look the nature of the analysis now are different, they are not very routine kind.

Profitability analysis, annual budgeting, production scheduling, so they involve some kind of analytical capability or summarisation. For example, sales region analysis. You have to have a summarized report 1st. Then you cannot have one extensive report. For example in making your production schedule, you need one analytical model here and so on. Whereas in case of your executive support system, the nature of the information required is actually very different from that of the low level.

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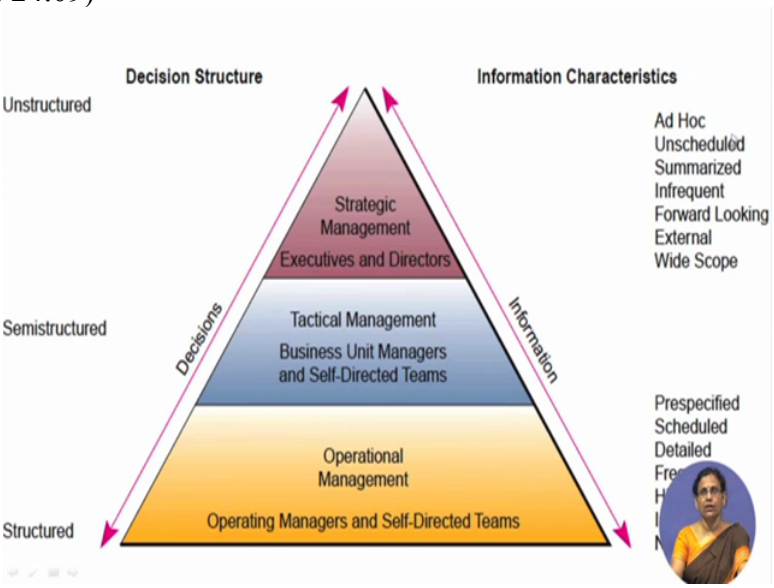

Here actually as I have already told you, here it is more ad hoc, unscheduled, summarised, infrequent and so on. So accordingly, when you make let us say your make your profit planning, your personnel planning, and so on and deciding whether to be there in the market or not to be there in the market, such kind of decisions are taken at these levels and your executive support system provides input to top level management.

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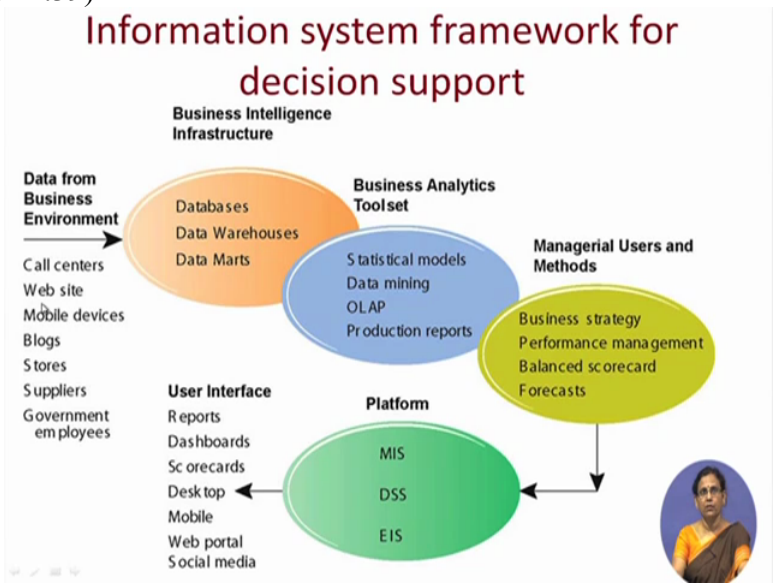

Now if a management has to take decisions, 3 things are involved here. 1st, it has to have one business intelligence infrastructure which takes input from the business environment. And this

environment, it can come from many sources. It can come from call centre, it can come from website, from mobile devices, blogs, from your stores, from suppliers, from your governments, employees, from means besides these are some of the external sources. From internal sources also it can come.

Data can come from the business environment and it gets stored in the business databases warehouses and so on. Then you need a set of analytics tools like your statistical model, data mining tools, OLAP tools, production report, et cetera. Then you have many users who will be actually using this and you have various methods for presenting the data, for deciding the business strategy, for performance management through balance scorecards, through forecasts and so on.

And using this MIS, DSS and executive support systems, you can actually provide the various levels of management the reports of various forms through through either through hardcopies, through dashboards, to scorecards to this mobiles, web portals, social media and so on.

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Types of System	Information Input	Type of Processing	Information output	users
ESS	Aggregate data from internal and external sources	Graphics visualization, simulations, interactive	Projections, responses to queries	Senior level managers
DSS	Low-volume or massive databases optimized for data analysis, analytical or statistical models	Optimization, simulation, Data analysis, interactive	Special reports, Decision analysis, responses to queries	Middle level managers
MIS	Summary of transaction data, high volume data possibly from multiple sources	Simple models, Routine reports, Low level analysis	Summary and exception reports	Middle level managers
TPS	Transactions, events	Sorting, listing, merging, updating	Detailed reports, lists, summaries	Operations personnel, supervisors

So if you compare 3 different, in fact you saw that we have for 3 levels of management, we have 4 different kinds of business support system. At the lower level, you have transaction processor system. For the middle level, you have MIS and DSS, for the top level, you have your executive

support system or executive information system. So as you know, every information system have certain input, it takes certain input and it produces certain output.

If you look at the nature of the input, as I have told you already the nature of the input throughout these 3 levels, actually vary. So if you look at the nature of the inputs at the ESS, it is actually the aggregate data. In fact we let us start from the lower level, at the transaction level because transaction level actually provides the data to all the upper levels. So in the transaction level, it is actually the transactions are the events.

And the very rudimentary kinds of processings are done here-sorting, listing, merging, updating, so those are the kind of processing it happens at this level. And it produces very detailed reports and this is basically as we have told for operational level. Then in MIS, it takes input from the TPS and basically it is the transaction summary. Either it can come from a very high volume data and possibly can come from multiple sources.

And here, you use simple models and the reports are basically routine reports and here you have very low level analysis. And the output is in the form of summaries, exception reports and so on. Then we again in the middle level, you have DSS where the data can be either low-level summarised data or it can be very massive datasets. And this massive datasets, we use for statistical processing and this low-volume, summarised data are can become the parameter inputs for the analytical models.

Here you can have optimisation, simulation and data various type of data analysis and these are the kind of processing that can happen here and it can be interactive. And by interactive, we mean as I was telling you in one of the earlier situations, you will be actually providing input to the system and you will be you basically when you are not very sure about your parameters, you can keep changing your parameters and do some kind of sensitivity analysis.

Again, there are some special kind of reports which are produced through this and they can because they are interactive, they can provide answers to the queries. And in your executive support system, the nature of the data completely changes. It is from both internal sources as well as from external sources. And high degree of see here we cannot lose because the decision-making situation is so unstructured, mostly you cannot have analytical models made for this.

So therefore mostly it is about visualising the information through appropriate form, through graphics, through proper visualisation tools and simulation outputs and so on. It can be interactive. And this information output can be projections, response to various queries and so on.

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DSS Vs. MIS

	Management Information Systems	Decision Support Systems
• Decision support provided	Provide information about the performance of the organization	Provide information and decision support techniques to analyze specific problems or opportunities
• Information form and frequency	Periodic, exception, demand, and push reports and responses	Interactive inquiries and responses
• Information format	Prespecified, fixed format	Ad hoc, flexible, and adaptable format
• Information processing methodology	Information produced by extraction and manipulation of business data	Information prod analytical modeli business data

So though this decision support system and MIS are actually both meant for the middle level management, there is actually huge difference between these 2. 1st one is actually quite simplistic and not does not involve much analytical or statistical processing. And 2nd one is little complex. The 1st one is that if we look at the kind of decision support provided, the 1st one is for providing information of the performance of the organisation.

Whereas in case of a decision support system, it provides information, decision support techniques to analyse specific problems or opportunities. Then the 2nd criteria for making the difference is the kind of the form of information and frequency. So in the 1st case in case of MIS, it is periodic and exception, it can be demand driven or it can be pushy reports. But in case of and decision support system, mostly it is interactive enquiries and in turn, you get responses to your enquiries.

Then 3rd one is your information format. Here it is pre-specified and fixed format. In 2nd case, in case of DSS, it is ad hoc, flexible and adaptive format. Then the 4th point to distinguish between

them is information processing methodology. As I told you, it is about it uses very simple methodologies for extracting and manipulating business data like summarisation, et cetera and the 2nd one, you have statistical or analytical model built with this.

Again, within the decision support system, as I have told you, decision support system can be broadly classified 2 types. One is analytical decision support system , decision support system with the analytical model and the 2nd one is decision support system with the statistical model.

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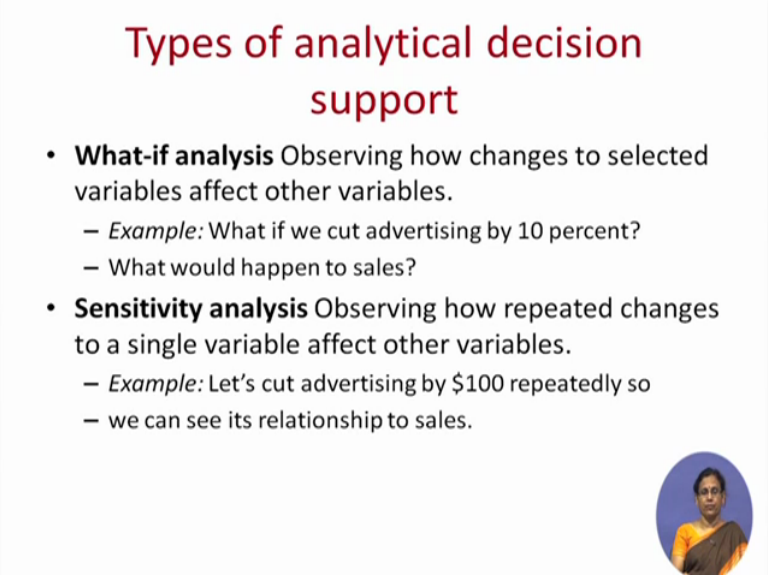

So let us try to understand what are various types of analytical decision support that can be provided by a decision support system. So it there can be 4 categories of such analytical decision support, 1st one is what if analysis. Look, in a analytical decision support system, you have an optimisation model. So most of the time, these parameters provided to the model are not known exactly apriory, so which means, the parameters are now to be changed and the effect on the output need to be observed.

So if we so observing how the changes of selected parameters, selected variables affect other variables, if we try to study it, those kind of things are covered what if analysis. The example includes what if we cut the advertising cost by 10 percent? What if, you serve the model with certain advertising cost, now you would like to observe if I decrease my advertising cost by 10

percent, how my profitability is getting affected, how my sales is getting affected. So you would like to that change the parameter and see it.

Then the next case is your sensitivity analysis. In case of sensitivity analysis, see what we did previously? We tried seeing if we cut my advertising costs by 10 percent more about the effect? Now let us try to do in a systematic manner. If I decrease in the 1 percent, what happens? If I decrease it by 2 percent, what happens? By 3 percent, by 4 percent, by by…till 10 percent.

So if I decrease it in a systematic manner, and with this repeated changes, I make the observation, then it is called sensitivity analysis. So this sensitivity analysis report can also helps a lot in decision-making.

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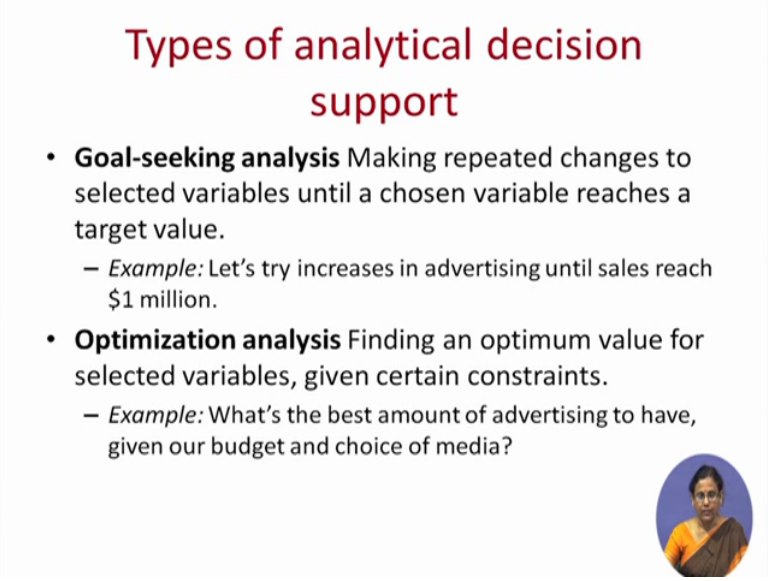

The 3rd category is called the goal seeking analysis. Here here you let us say, I would like to achieve my sales of this much amount. For this, what should be my spending on advertising? So what I will do? I will try increasing my advertising budget till I achieve my targets sales. So if I continuously do this process, continuously do this and observe the effect of increase in my advertising model, not only on sales but on other parameters of the model, then it is called a goal seeking analysis.

Then the 3rd one is optimisation analysis in which given the values of selected variables and scertainudden constraints, what is the best performing thing can come out of it? So a kind of

answer that the continuing with the example that we happened discussing, let us say what is the best amount of advertising to have given our budget and choice of media.

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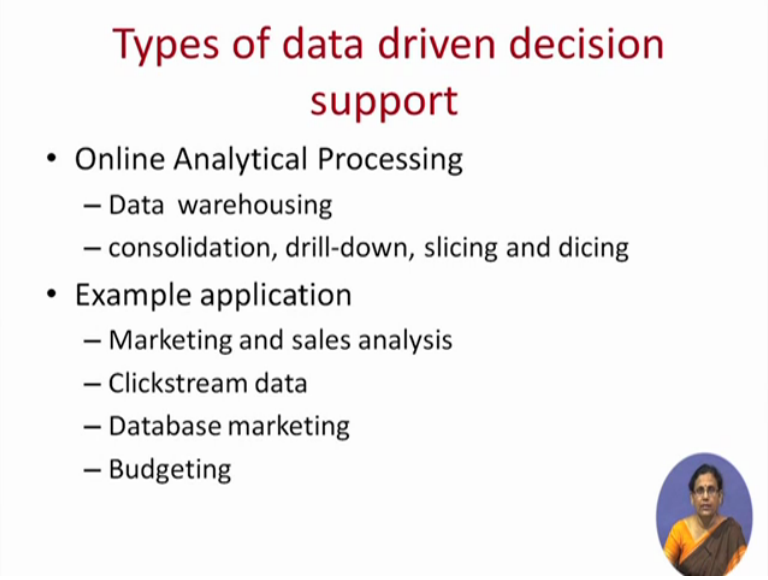

Then next we are going to see what are various different types of data driven decision support. So 1st one is your, I mean the 1st one in this category is can be your online analytical processing. And in case of your typical database management system, you have relational queries where you have only two-dimensional data but in case of online analytical processing, 1st task is to build a data warehouse which handles multidimensional data coming from various sources.

So here the data is - the higher dimensional view of the data is actually observed. You can actually do consolidation, you can drill down the data, you can do slicing, you can do dicing. In fact, about when we talk about the technology part, we will be talking more about it. I mean how to do consolidation and what do we mean by drilling down? But let us say to cite one example, let us say consider the case of drilling down.

Just try to remember the sales regenerator that we were discussing in the MIS report. In the MIS report it is a let us say in the eastern region, this is the amount of sale. Now in the eastern region, if you would like to now sell, see that within eastern region, what are the sales in various states we are actually drilling down the data? Then again, from a particular state, let us say within every subdivision, every district, what is the sales? Every subdivision, what is the sales?

If we go down and down, it is called drill down. Similarly, when you have multidimensional view of the sales, according sales region, according to time period and so on, and if you like to reduce one of the dimensions, it is called slicing. Now you reduce multiple dimensions, you get something known as a dicing. So those details we are going to see.

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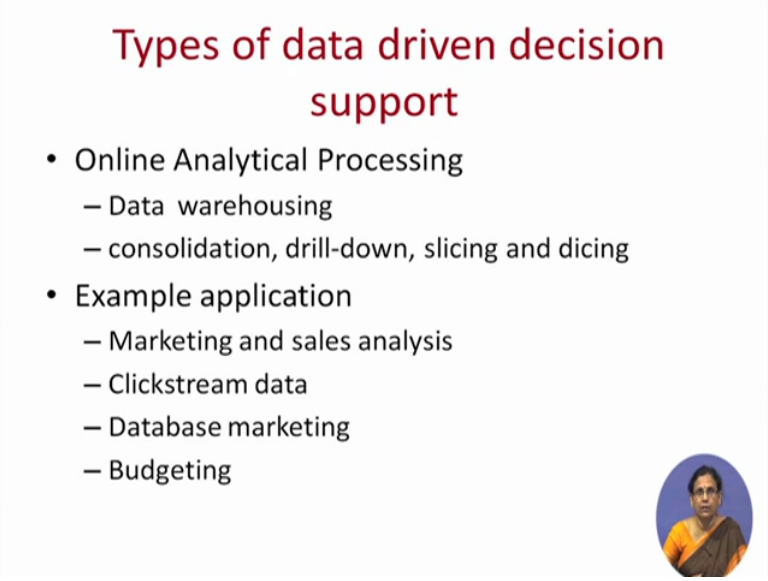

So those kind of those the typical applications of this analytical processing or marketing and sales analysis, analysis of clickstream data that comes out of the websites when the users browse websites, then database marketing, budgeting and so on.

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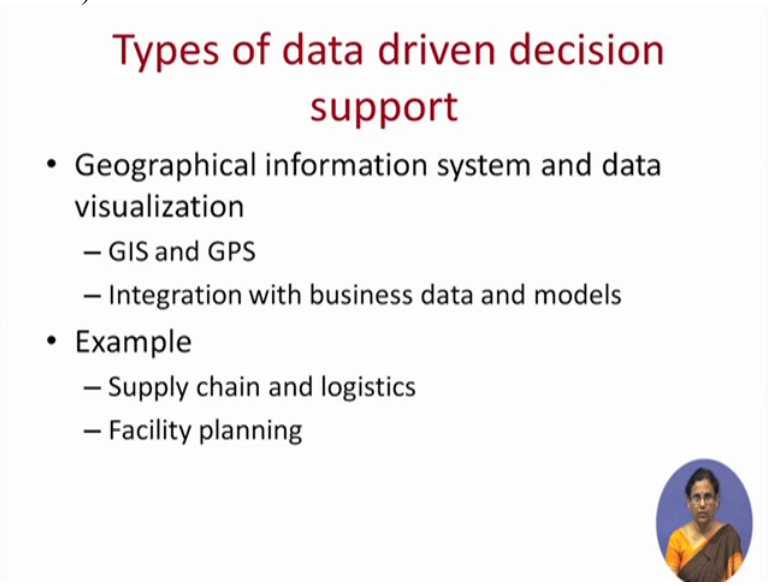

Then the next one is actually about data visualisation about data visualisation. There are many times, the analytical models and the various business models are integrated with such visualisation systems and typically those on a particular map which comes out of the geographical Information Systems, it the output that is coming out of the analytical models are shown. For example, you are taking a decision about where exactly to locate your warehouses.

So it is a facility location problem. So in that case, your see as I have told you, many of the constraints are difficult to model and cannot be actually put into the decision-making situation so which gives rise to a semistructured decision, I mean this is particularly true for semistructured kind of decision-making situation. So under this kind of situation, let us say for example you consider the case of selecting the location of your warehouse.

Now based on your analytical model, you got certain solution. Now those solution, you put on a map, which comes out of a geographical information system. And on this map, once you put, see, you have not included all the constraints now suppose you now realise the warehouse that you are going to make is actually coming on a place which is highly populated or let us say it is a riverbed because you have not considered the path of the river as your constraint.

Because why you have not considered? Because it is difficult to model. So once it you see on a geographical permission system, you see that it is coming on such a undesirable places but your model is telling that this is the right place where all other constraints are getting satisfied and your profit is getting max getting let us say profit is getting maximised if you select that warehouse location, then what you should do?

Maybe looking at this, you try to adjust, I mean the the constraints which were not taken care of, let us say it has come on a riverbed, then you adjust the location into a position so that it is not on the riverbed, it is on a but it is on a nearby place where you have sufficient place to set up a warehouse. So there you you can find many such examples in supply chain logistics, facility planning and so on.

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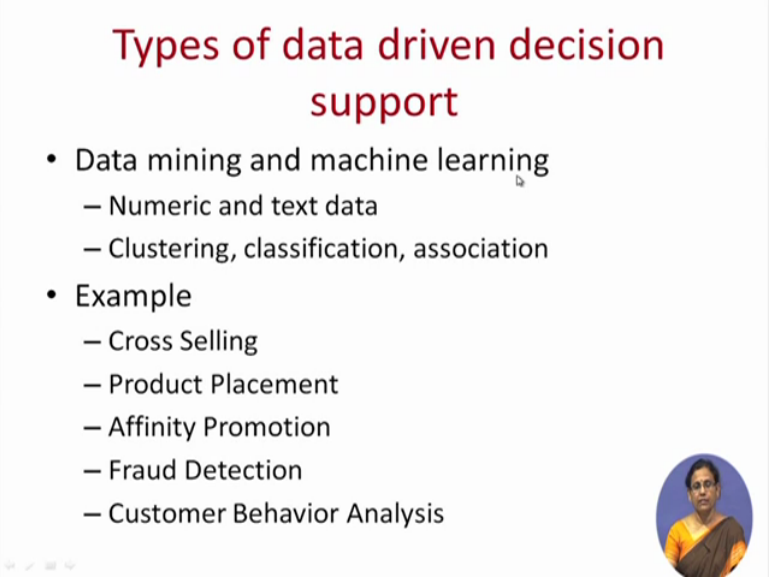

Then the 3rd category is you are applying various data mining and machine learning techniques. Look, if you have a statistical model, basically you know what answer you are searching for. You know the procedure and you know that this is the kind of answer you are searching for. But in case of data mining, what you do is you discover knowledge. You discover the knowledge, the facts which are, the relationship which are not known apriory.

For this, you use various kinds of clustering, classification and association and the analysis and many learning techniques are also used. So such techniques are used basically in the situation for cross selling, product placement, affinity promotion, fraud detection, customer behaviour modelling and so on. In fact, in some of, this customer behaviour modelling while talking about decision support possibly we will be talking about customer behaviour analysis.

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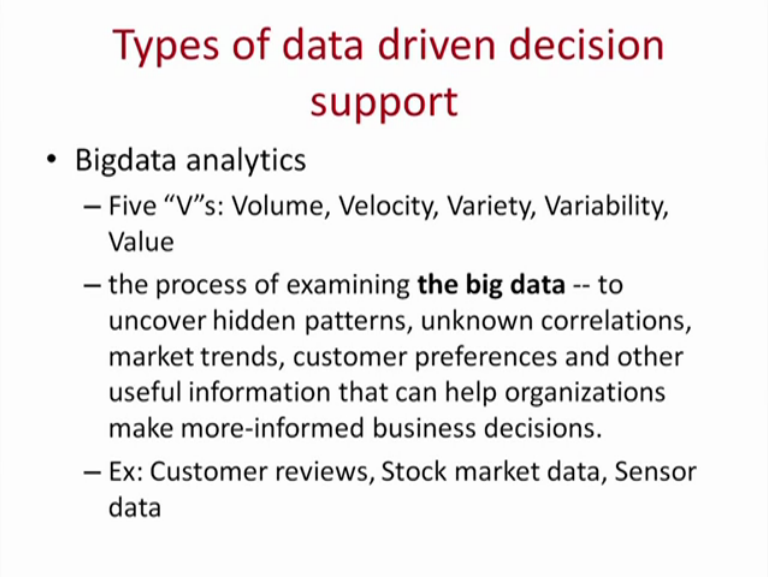

Then the last one is actually a very trendy term. It is about the big data analytics. Big data is actually has their has 5 Vs associated with it. It is a high volume data. It comes, its amount is huge. Consider the sensor data. If you are tracking a product in a supply chain, and the temperature associated with this perishable product, you are constantly capturing through some sensors, you get huge amount of data. Stock market data, huge amount of data. And they come in most of the time, they come in very high frequency.

Sometimes, it is only volume. For example, your your customer it is your customer review data. It comes in high volume. It is unstructured but it may not be coming in a high velocity but there are situations when the data comes in high velocity like your stock stock market data. It comes in very high velocity. And there is variety associated with the data, different kinds of data.

For example, consider your consider your customer data, some customer review data, sometimes it can be numeric data, where they provide certain input in form of the product performance, it can be some text data and so on. So there can be variability in the data. The data changes frequently. One term one term which is that again considering this customer review data, sometimes one term somebody is using for something, 2nd customer will be using the same short form for something else.

So data variability also comes in. Then such kind of analysis, the 4th, the 5th one actually many people actually drop the 5th one because it is not related to the nature of the data, rather it is the characteristics of the data that that is required for making the analysis because analysing this big data requires a huge amount of investment from the side of the company in terms of both infrastructure and getting the knowledge workers for working on that, so therefore, company should apriory should have the belief that the data has value for the company, it can generate value for the company.

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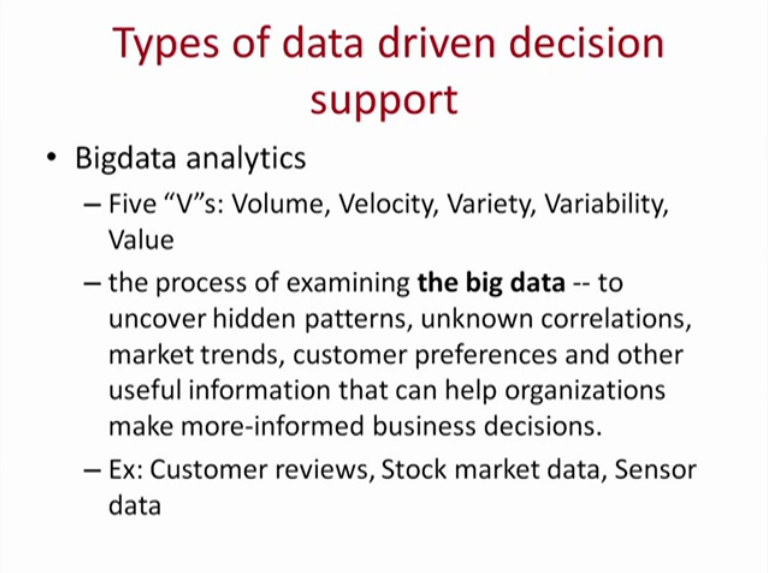

Now what is big data analytics? It is the process of examining the big data to uncover hidden patterns, unknown correlations, market trends, customer preferences and other useful information that can help organisations for making more informed business decisions. As I told you, your customer reviews, stock market data, sensor data, these are examples of your big data. With this, we finish this lecture. Thank you.