Computer Aided Decision Systems – Industrial Practices Using Big Analytics

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Lecture 01

Introduction to Decision Support Systems (DSS)

This is the first chapter of the decision support system course for practitioners and researchers alike. As you might have read in the introduction slide, this course is meant for both management practitioners, as well as students who are pursuing their career in management, in specifically to the academic side.

So, we will look at both the applied side of it and a little bit of the academic side of it. So, it will be a mixed flavour course. So, today is the beginning lecture and we will try to get into this decision support system and why this decision support system is an important tool for this management decision making.

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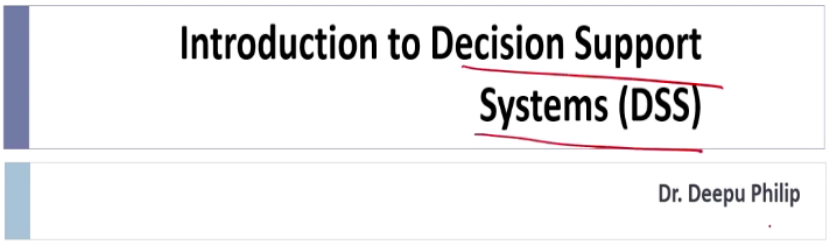

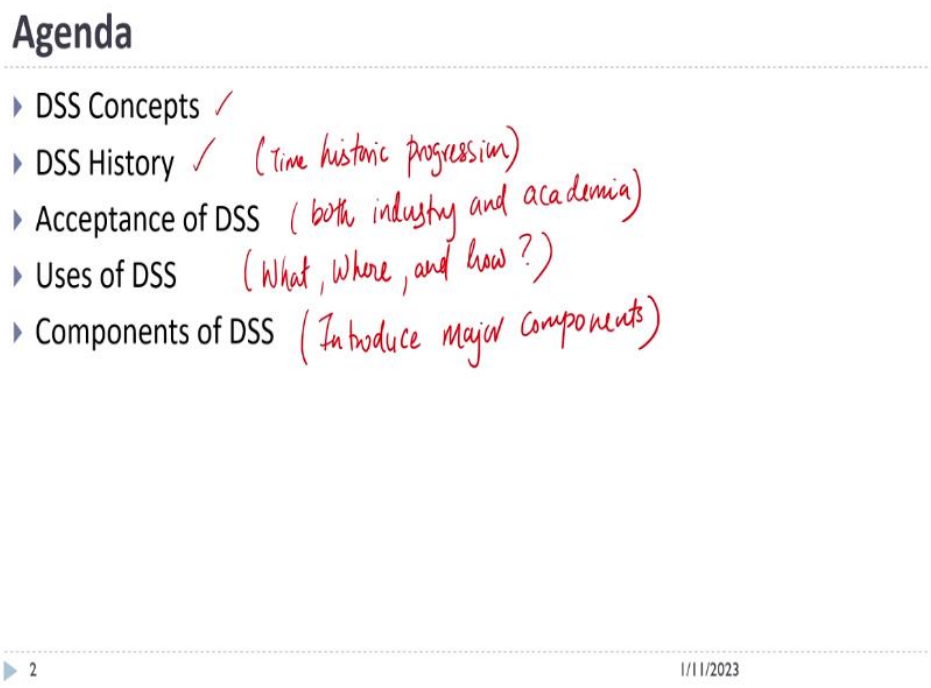

So, if you see the slides, the title is Introduction to Decision Support Systems and my name is Dr. Deepu Philip. I am from IIT Kanpur. So, in today's agenda, mostly we are going to talk briefly about these concepts. We will enhance these concepts in the later presentations. The first concept we talk about is the DSS concept. What is DSS and what does it entails to.

Then, we talk about slight history of DSS, how it actually progressed, how it actually spends over time. So, this is the time historic progression. Then, acceptance of DSS: industry and academia. We will be talking about the acceptances of the DSS in both areas.

Then, we talk about the uses of DSS. So, what, where and how the DSS is used, that are the major aspects, we will be discussing on this. And then the last will be the introduction to. So, we introduce major components, what are the major components of DSS is what we will be discussing and then once this, we will move to the next one.

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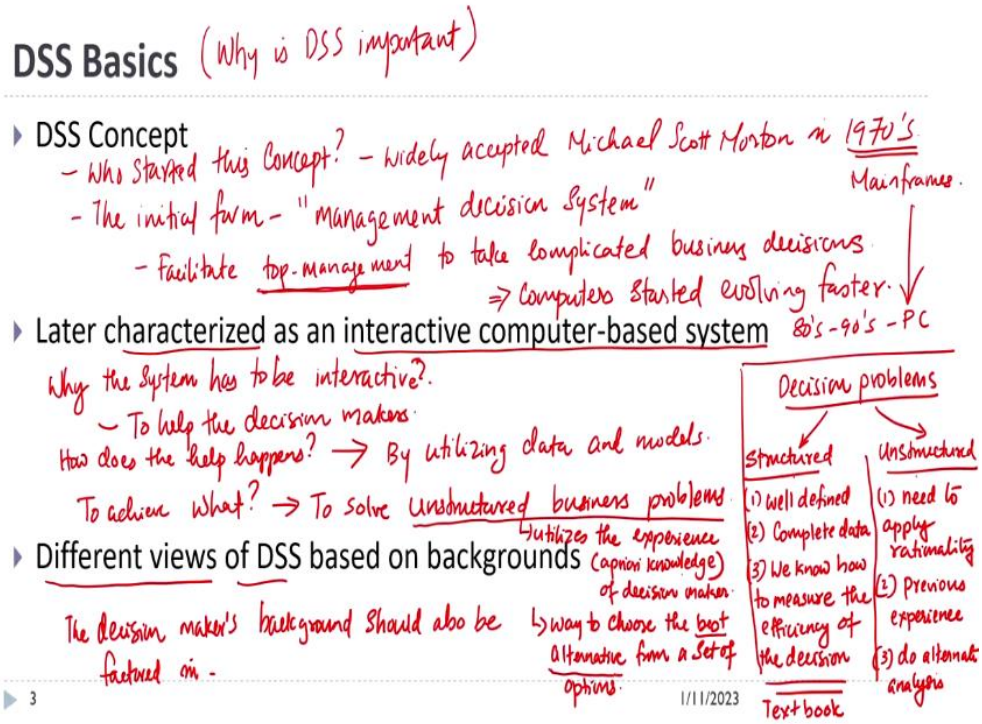

So, without delaying further, let us talk about the basics of DSS. As I said earlier, why is DSS important and how does it come around? So, the DSS concept, there are so many people. So, one of the questions is who started this concept. There are many debates on this, but widely accepted name is Michael Scott Morton in 1970's. He was the one who actually proposed this concept or who created this concept, and the initial form it was known as management decision system.

It was not called as decision support system, it was more called as management decision system. The aim was to facilitate top management to take complicated business decisions. So, this was the reason; the first version of it actually focused on the top management to make complicated business decisions. So, hence the name was management decision system.

Then later it became, what we call as the decision support system. Then later as the computers improved, computers started evolving faster. In 70's, we were talking about mainframes. So, later down the road in 80's and 90's we moved to what we call as personal computers or powerful desktops.

So, as the computer system started evolving faster and more and more computation power was available, this management decision system was characterized or told to us as an interactive computer based system, a computer-based system that you can interact with. So, why do you want to make it as an interactive computer system? This is the fundamental question of this. The main reason why it has to be interactive is to help the decision makers. And how do or how does the help happens? By utilizing data and models. And to achieve what? To solve unstructured business problems. So, this word is very important, this unstructured business problem is very important aspect in this one. Before we get into this, let us talk about the two-type of problems.

As I said earlier, we can broadly classify the decision problems into two. One is called as a structured decision problems and the another is the unstructured decision problem. So, what is a structured decision problem? The structured decision problem is very well defined and second

thing is, it has complete data. Total data is available with you in this for this particular case and the most important thing is, we know how to measure the efficiency of the decision. And most of the time, we call it as also textbook problems. This structured decision problems are usually available in textbook and very rarely available in real life.

In the unstructured decision problems or unstructured decisions, you need to apply rationality. We will talk about what is rationality and rational decisions later down the road. You also need to have some previous experience or a prior experience and there are other aspects to this. And the third most important part is, there is no single decision.

So, we need to do alternate analysis. We need to look into different alternatives and we need to find out which one of these alternatives is really effective and efficient in this regard. So, most of the time, the unstructured business problems utilizes the experience. The other name for experience is apriori knowledge. So, the unstructured business problems utilizes the experience or the apriori knowledge of the decision maker.

Once the alternates are analysed by the decision maker, then you basically choose. You have a set of options and from which you select the best alternative, whatever be the best one that you think you can, that is the best alternative is the one that you end up choosing as part of this.

So, the idea of this one is, when you have to look in different alternatives, it will also give rise to different views of the decision support system based on the background. So, the decision makers background should also be factored; which means if the person is technically sound or non-technically sound, can the person be comfortable with a computing system etc, that is all part of the decision making at this point.

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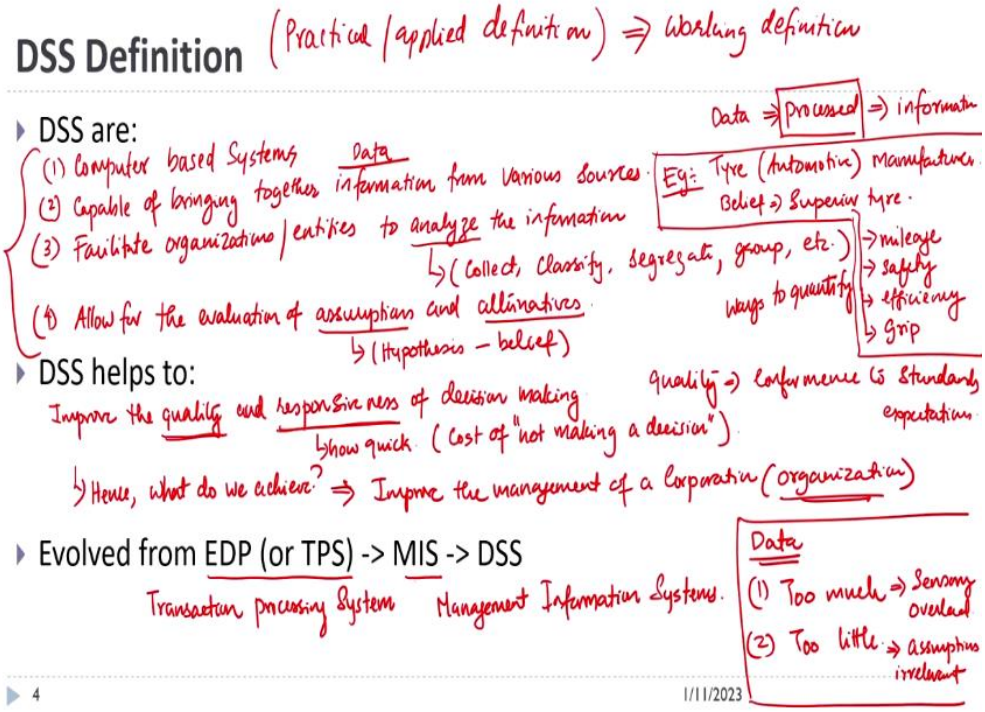

So, we now move into the definition of the DSS. How do we define DSS as part of this? So, there are many definitions available. So, we are talking about practical or applied definition or in other words about working definition.

1) It is a computer-based system.

2) It is capable of bringing together information from various sources. You have information, you can call it as data also; when you process data you get information. So, either bringing together data or information from various sources, either one.

3) Facilitate organizations or entities or individuals to analyse the information. It is not just analysed. You can think about it as collect, classify, segregate and then group, etc. Analysis is not just taking a numerical value out of it. You basically, you are able to do different actions using this information.

4) Allow for the evaluation of assumptions and alternatives. So, what is assumption in this regard? It is hypothesis or belief.

So, what is an example of hypothesis? Let us take a small example of a automotive tyre manufacturer. The automotive tyre manufacturer believes that his tyre is superior to others. So, the belief is superior tyre. Now, the superiority can be done in many ways. It can be on mileage, so this tyre will run for like, let us say, one lakh kilometres or something, or it can be on safety. It will never get punctured or something, or it can be on what you call efficiency. Minimize tyre noise and other kind of things. So, there are so many ways you can establish the superiority of the tyre. So, in different ways or different measures, these are all measurements or these are all ways to quantify. So, system should allow you in multiple ways to quantify and evaluate all these quantifications. That is one of the important aspects of this.

So, if any system that allows for all these four things, you can generally call it as, computer-based system. It is capable of bringing to the information or data from various sources, and it facilitate the analysis of information; not just calculating a numerical value but you can classify, segregate etc. And it also allows for evaluating the assumptions and alternatives.

So, what does the DSS helps you to do? The DSS help us to improve. It helps you to improve what? To improve the quality and responsiveness of decision making. What is quality? Quality is conformance to standards.

In decision making, it is a conformance; but it is conforming to expectations. You make a decision expecting something, and if whatever you expected happened as part of the decision then you can call it as a quality, the decision as good quality. And responsiveness is the quickness. How quick? The time that you take to make the decision.

So, a lot of the time people says there is a cost of 'not making a decision', which is usually very, very high in corporate world. Not making a decision usually happens only in bureaucratic world, not necessarily in corporate world.

So, when a system allows you to improve the quality and the responsiveness of the decision making, what does you achieve? It allows you to improve the management of a corporation or organization or an entity or a business and private limited company, whatever you want to call it.

It will allow you to improve or better manage the organization. So, ideally speaking, the DSS has evolved from EDP or TPS. TPS stands for transaction processing system. From there, it went to something called as MIS. MIS is Management Information Systems. So, from TPS we moved to MIS, from there it evolved to DSS.

One of the major reasons why this DSS evolution happened is, what happens about the data. The data has become something like big data, divergent data, and so many data things come into picture.

For us, in the decision support system course, we talk about data coming in two forms.

1) It is too much.

2) It is too little.

Either you have abundance of too much of data; otherwise you have too little of data. And in either case, you give the too much of data, you are overwhelmed by the data, you have no clue what to do with the data. And sometimes the abundance of the data just clogs up your decision making and this is very much. This too much is usually seen in sensory, it results in sensory overload.

And in too little, when you have very little of data, so, this is when you see people, pilots or somebody who are flying an aircraft and when all these alarms are beeping. You can see that they go into sensory overload and then they forget the fact that they have to just fly an aircraft, at the some point of time. Then, when you are too little, what happens is, you make assumptions; that you cannot verify, or irrelevant assumptions, and then make sub optimal decisions as part of it.

So, the data whether it comes too much or too little, the decision support system is supposed to handle both the scenarios or both the cases with equal capabilities in this regard.

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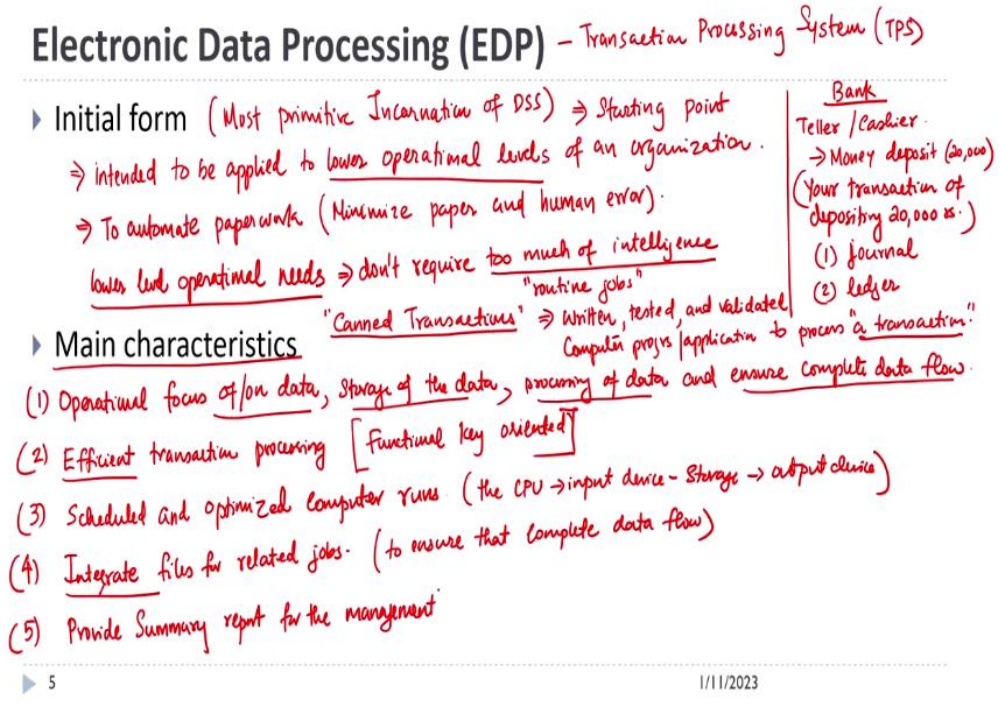

Now, we move towards the next one; which is the first part of the decision support system, we call it as electronic data processing, EDP or other name for it is, transaction processing system, what we call as TPS. So, this was the initial form; the most primitive incarnation of DSS. You can think about it as the father of DSS, or the beginning (starting) point of DSS. This is from where the DSS evolution started.

It was intended to be applied to lower operational levels of an organization. So, let us take an example of this. A bank, and one of the very lowest levels of operation is a bank teller or you

can call it as a cashier. So, you go to the bank, you take a cheque with you, or you take some money with you and let us say you want to do a money deposit. So, you have something like 20,000 Rupees in cash with you and you want to deposit it. So, you go, you give the 20,000 rupees to the bank person. What do they do? They first count the money, and then they open up the computer, they press a functional key, account number comes in, they type your account number, put this much money is deposited, enter that and then the data goes into the system and that is it. So, your transaction of depositing 20,000 rupees is facilitated by the system. The main aim is to automate paperwork. Instead of you filling paper, they filling paper, signing, sealing, giving it, or all those kind of things, this can minimize paper and human error.

In old days, in a bank, you had journal and ledger. So, what they used to do is, any transaction on a day, they record it in two registers, then used to put in a ledger, then it would transfer to a journal etc. By the time the bank operations are over by 2 pm or 3pm, until 6 PM you have to reconcile all the paperwork.

So, now with the help of a computer, you do not need to do anything. All these transactions are all digitally stored, and with a press of a button you should be able to find out what has happened. So, all these kinds of things, what we call as the lower-level operational needs, this do not require too much of intelligence. These are mostly the routine jobs. So, for facilitating these kinds of routine jobs and minimizing paper and human error, we came up with the electronic data processing and another name for EDP is also known as Canned Transactions.

So, this canned transaction means, they are pre-written computer programs; written, tested and validated computer programs or application to process a transaction. Our indentation is one transaction should be completely processed in that regard.

So, most of the bank database and other kind of things are classic example of electronic data processing system. So, what are the main characteristics, how do you distinguish?

1) The operational focus of or on data. You are focusing more on data.

2) Then storage of this data. So, make sure that the data is stored properly.

3) Then processing of the data. So that, if there is a numerical value, addition, subtraction, everything else need to be done and ensure that the complete data flow. So, they heavily depend. So, that is why it is scanned, because in one press of a button, this application of the program is available to you, and you can enter the necessary details and the transaction is available for you. So that, you can immediately process the transaction. So, the transaction is processed efficiently, that is the main part. So, most of the time it is functional key oriented. It is scheduled and optimized computer runs. So, the CPU, input device, storage, output device; this combination is scheduled and optimized in such a way that the complete transaction is processed properly.

4) It integrate files for related jobs to make sure that all the files that are related to the job are integrated at the same time. So, all those things are integrated.

5) It provides summary report for the management. So, you should be able to give the management, what is the summary of the transaction. If we are talking about a bank, the bank manager might need to know how much money was deposited, how much money was withdrawn, how many 500-rupee notes, how many 1000-rupee notes, or we do not have any 1000-rupee notes, how many 2,000-rupee notes, or whatever it is. So, that kind of information for the next upper-level management can also be provided as part of this electronic data processing.

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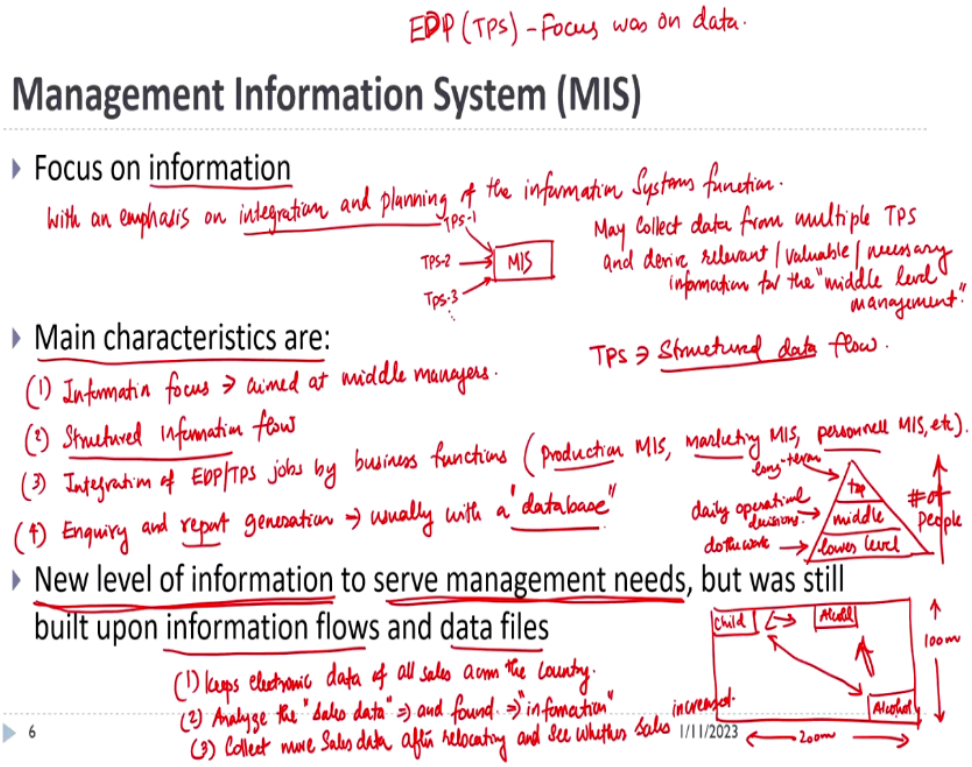


So, you started collecting more data on the transactions, and when you have more data on the transaction obviously then, you want to find out more information out of the data. And from that data you want to synthesize more information, which gives rise to the next revision of the decision support system, what we call as the management information system.

Here, in the MIS, the focus is on information. So, are you just focusing on information? You are focusing on information with an emphasis. You are emphasizing, with an emphasis on integration and planning of the information systems function. So, in this case, what actually you are looking at is, you may have an MIS, and MIS will be dealing with TPS1, TPS2, TPS3, etc. So, you may have multiple transaction processing systems, which will all be providing information to one MIS. So, may collect data from multiple TPS, and derive relevant, or valuable, or necessary information, for the middle level management.

Most of the time, the MIS was originally intended. This middle level is a very loosely used term in this regard. It is an aggregation of everything. The MIS is one level up, where multiple transaction processing system data is collected in one go and raised up to one level.

What are the main characteristics of MIS?

1) Information focus. You are not focusing on data, you are focusing on information, and hence aimed at middle managers.

2) Structured information flow. In TPS, it was structured data flow. In this case, it is structured information, what is flowing in this one.

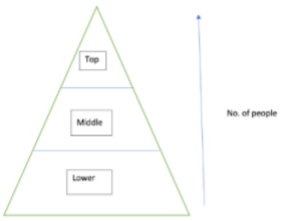
3) Integration of EDP or TPS jobs by business functions.

What do you mean by business function? One example is production MIS, another one is marketing MIS, you can talk about it as personal MIS, etc. So, what we are talking here is by

different aspects, different functions of the business, whether it is production, marketing, finance, HR, etc.

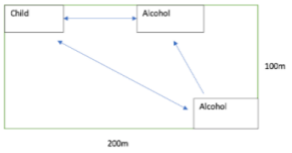
4) Inquiry and report generation. You are capable of inquiry, or putting a question and generate relevant report based on it, usually with a database. So, multiple related relevant data is collected together to create a database, and this database from which you are able to inquire or ask questions, and get a relevant report or information out of the database.

So, the indention here is, you obtain a new level of information from the data that is stored to serve management needs. So, you may want to do something as part of this, but was still built upon information flows and data files. So, you still using information flow and data available. For example, in a management stuff, as you grow up in the main ladder, so we give this triangle.



So, there are three levels of management :lower level, middle level, and the top level. You have more people at the lower level, and lesser in the middle, and very few are the top level.

So, the lower level is the one who basically do the work. The middle level is the one who make the daily operational decisions. Other top management typically makes it. So, let us take an example to show how this works. So, let us say there is a big super store. Let us say, this is like 200 meters long, and 100 meters wide, big superstore, let us assume it this way.



Child section is far apart from the alcohol section, just to make sure that the children does not go to alcohol and do not drink or something like that. This store keeps electronic data of all sales across the country. So, you have all electronic data, every sale data is logged. Then let us say, you analyse the sales data and find that the people who tend to buy diapers in the afternoon, also tend to buy beer. So, maybe they get tired by changing their kids diaper, we do not know.

So, when you found that the people who buy diapers in the afternoon, also tend to buy beer. That is the information you have. This, you did not know earlier. So, then it does not make sense to keep them this far. You may want to move them to the same level. So that the distance is reduced. Even though it is separated a little bit, but the people can fetch alcohol for quickly.

Now, once you have this, this movement of alcohol section from this extreme corner to nearby the kids section is an operational decision made by the store manager, and once a decision is made, is a decision good or bad, how do you know? Then, you collect more sales data, after relocating, and see whether sales increased.

If the sales have increased, after you moved the alcohol department from one corner to near the child section, and you get more money out of it. So, as from the daily operational aspect to make profit, it is a good and wise business decision.