Management Information System
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Lecture - 19
Data Flow Diagrams - IV

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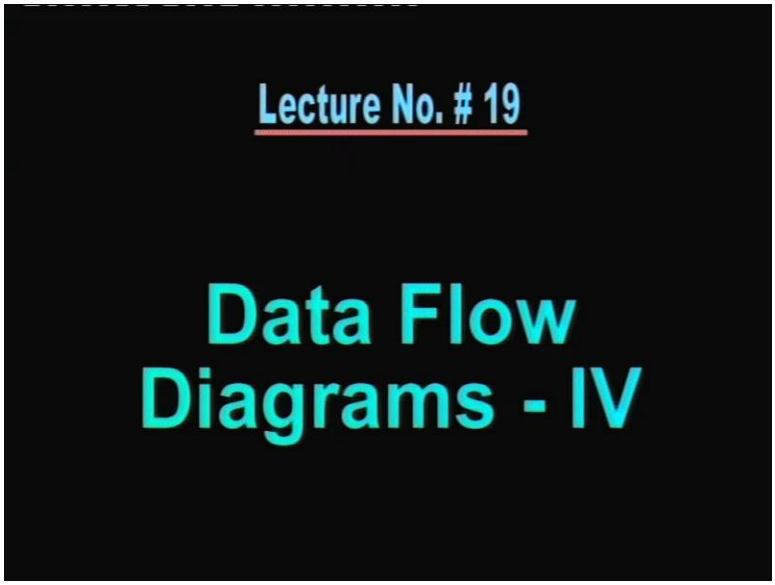

Right, so today let us take up another case study on a buying and selling company. So let us look at this particular case that a buying and selling company is one where we have a customer. The customer places orders for the items right and the company keeps record of its regular customers, names and addresses, history of purchases all right. So basically what is happening here the company is you know it keep track of who are the customers who is coming on a regular basis and keeping what are the various things that the company, the customer has actually purchased. Similarly, it should also keep the record of the items, so one hand you are the customer is placing order and for some items. Now the purchase, history of purchases actually you know what he has bought, what how much price he has paid, what are the items he has bought and which brings us to the item master, you know what are the items usually bought and in a details, we can also have what is known as the inventory master? Inventory master is essentially the stock of items at the present moment that is another thing.

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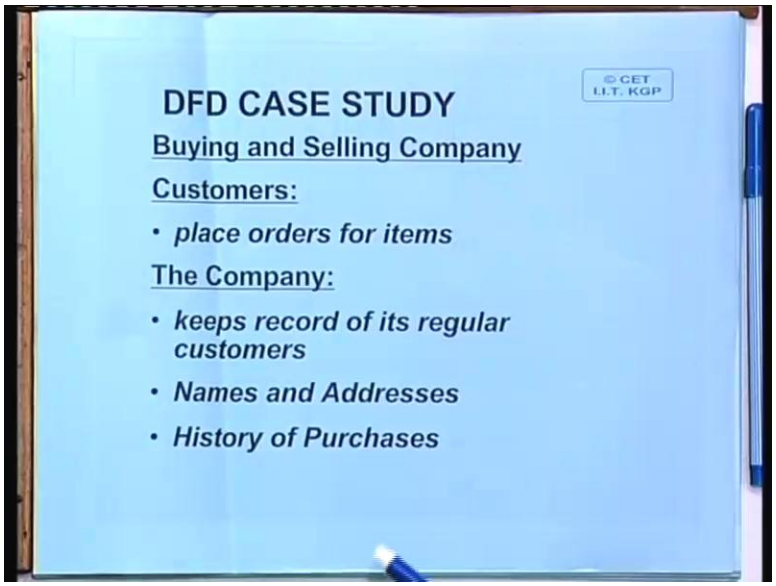

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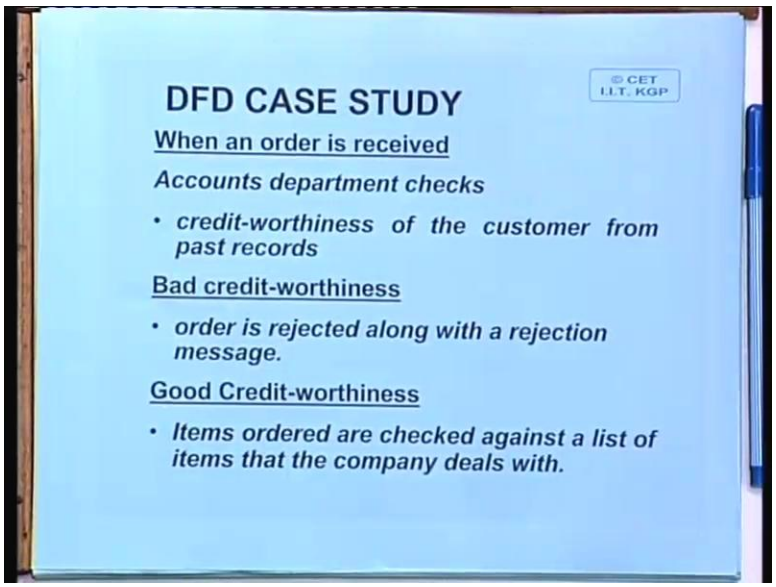

Now certain processing is to be done suppose an order is received. So when you receive an order the first and foremost thing the accounts department should do check the credit worthiness of the customer from the past records because these customers has ordered previously as well. So what

has happened at that time, as it paid on time or you know took long time to pay or given some cheque which has actually bounced so all this things.

So we can broadly classify into two categories of the customers one is the bad credit worthiness and the second is good credit worthiness, I think one more thing is we should define some sort of index basically you know if you are trying to think of computerization of the same, you can think of based on some old purchases we should have certain criteria and based on these criteria, we should have a field something like credit worthiness all right and we should put it yes or no, depending on your current analysis right.

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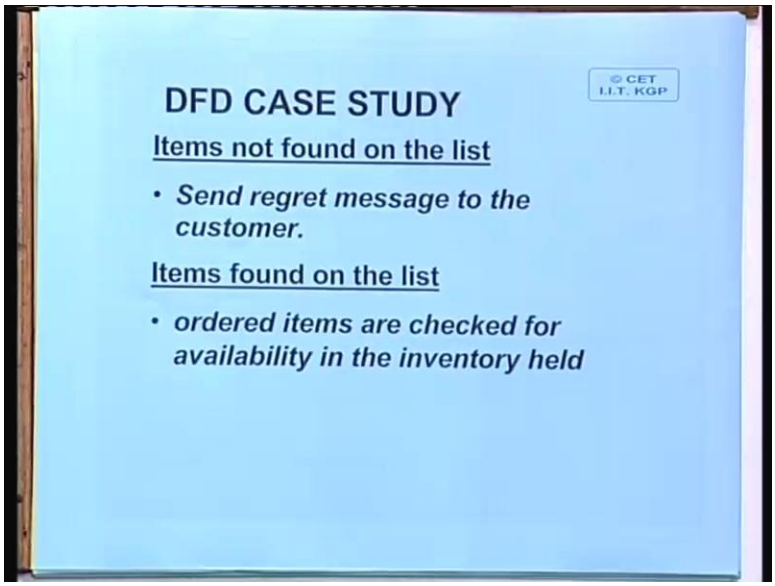

So if you find the credit worthiness is bad, reject the order and send a rejection message to the customer say, that we are not interested in your order. However, is a credit worthiness is good the items ordered are to be checked against a list of items that the company deals with. So this is one thing that company keeps that is what is the list of item that the company usually does business? Then again we can have two scenarios, what are the two scenarios? First one, items are not found on the list, items are not found on the list that means this is an item which the company does not deal, deal with.

So when these happens then send regret message to the customer all right and otherwise, ordered items are checked for availability in the inventory field. So you can check it against an inventory that is held by inventory actually means stock is like a physical it is like a go down, all right where you stock your items, stock your items need not be a go down per say because it is a buying and selling company. Now actually what it is buying and selling depends suppose, it is an item like a food stock then basically it is a go down all right. No body puts foods stock in the show case.

So all these rice… and all these kinds of things there available in the go down and basically it is to be taken from there but suppose it is another type of items, stationary goods then it there may be a show case as well, all right. Then stock may be actually in the show case but we are assuming it is slightly bigger company not really a kind of a grocery shop but it is a some kind of raw material whatever it may be, it could be steel, it could be cement or it could be any other building material, stone chips. So, so, so on and so forth which actually they are holding in the inventory. Now two things can happen again the items are available in the required quantity or items are not available in required quantity. So what has happened, you have checked your items against the inventory and when you check you find that not enough quantity are available at present.

So if they are available in not available, what should be done, items along with the customer ordered details are stored separately as pending orders. So these should go as pending orders all right that means you cannot supply the orders immediately, cannot supply the orders immediately until unless the stock is replenished. So first and foremost you have to replenish the stock, may be go for some purchases after the purchase is done then you can probably go for you know fulfilling the orders.

So what happens if the items are available items are sent to the customer along with a packing slip and an invoice all right, packing slip we is basically you know, list of items, a packing slip is a list of items, what are the items which are being sent along with this and invoice actually is a word which essentially means that along with the items, you are sending the bill as well. The invoice is actually the amount that you have actually sent, the items you have sent how much

money you are charging for that bill, it is a kind of bill. In fact in our country we use another word called challan right, instead of invoice another thing is we use the word challan.

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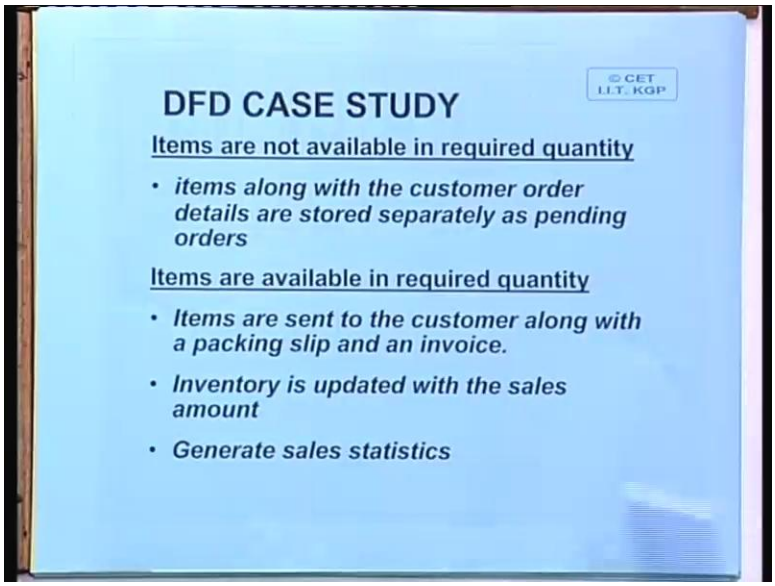

So this invoice is a basically are to be sent to the customer and obviously, a delivery advice, delivery advice because some times what happens, you are not really sending the item directly to the customer, you may be sending it to a transporter. So transporter requires a delivery advice. So these are the then you have to update the inventory with the sales amount basically deduct it all right and generate sales statistics, there could be various kinds of statistics for example, how much has been sold each item wise, item wise how much is the has been sold then what kind of customer has bought it, is it okay and so on and so forth, there could be 1001 sales statistics then the another dimension to this particular problem is the purchasing.

So purchasing we have had a case study but that is a detailed one we had starting from indents to tendering and raising of purchase order and all this quotations and comparisons statement, various meetings, purchase order, tracking of purchase order ,you know we have we will not leave that particular case study will come back to that later on but this one because it is a small buying and selling company.

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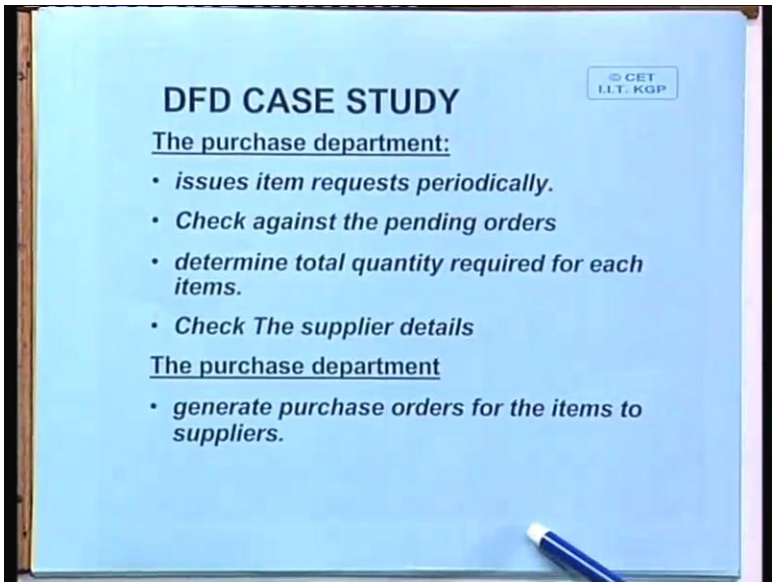

Let us assume that it is a simple one it is a simple one what is happening that the purchase department based on its analysis basically, it does its own analysis. So it issues item requires requests periodically, item requests that item should be actually purchased then check against the pending orders. The pending order file you can check and determine how much total quantity required for each items. Actually it need not be done this way it could be done on the other side that is monitoring the inventory, how much is held in the stock presently and is a stock sufficient, if the stock is not sufficient then you can actually go for you know item requests.

So it could be 2 ways, one is a periodic thing every period you review, it is a periodic review and try to see what is the situation, how much to be bought and replenish that much amount or you actually monitor the inventory when the items fall below a pre specified quantity usually called reorder point, ROP and then issue the order all right and you have to check against, how much is pending because that will determine total quantity required for each items, check the supplied details and then generate purchase order for the items and send it to the suppliers all right. So now in this particular case study, we are excluding the delivery process, raw material delivery process. We could have included that also but I have excluded deliberately because the model could be too much complicated, all right. Basically, it is the same process like the buying and

selling company is you know selling to the its customers similarly the suppliers are selling to this company, is it okay.

So this company is like a customer to its suppliers. So for this supplier again similar process will be there and similar structure could have been added but not the suppliers' side, the customer side all right some, some structures could have been added but I have not added it. Then finally, another entity involved here is the management what the management of this company should do the it should make query ith regard to statistics of sales and purchases, since purchases I have not taken into account. So the purchase part will not be shown right the purchase part should also be included here but it has not been shown because I have not modeled it.

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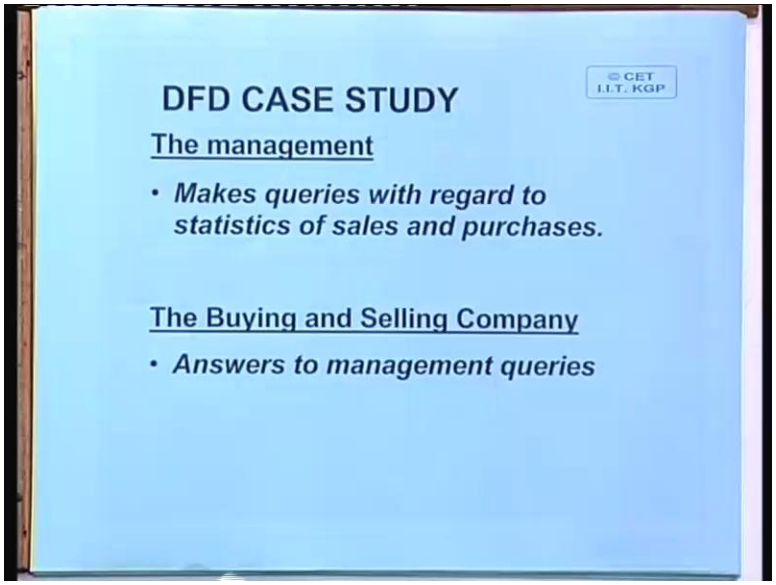

So what will be there the sales statistics, so management can have a number of queries from time to time say for example, management may like to know what are the items that are being purchased frequently, what are the fast moving items all right or similarly, on the other side what are the non-moving items all right which item is giving us the maximum profit just because something is fast moving did not give us lot of profit by the nature of certain items you cannot have much profit margin all right whereas a product however simple it may be just because you have done a little bit of value addition probably you can make a lot of profit all right.

So most often it is a simple product but you are not doing anything it is a package item you are just selling it across the counter, you are not doing much but suppose you are buying some, some specialized item and just packaging it properly all right. You may be buying at 100 rupees kg but you may sell per gram may be 10 rupees or 5 rupees all right. So you can make lot of profit there all right so that is what happens sometimes just by doing little bit of packaging or value addition you can get lot of profit on some items. So just because something is fast moving did not be the best, so another query could be what is fast moving but the profit margin is minimum all these queries can actually be asked and answer to this queries are to be provided all right.

So you have understood the description I think, now spend few minutes time to draw the context diagram to begin with what should be the context diagram try, first and foremost to draw the context diagram, what is required is identification of entities. So what should be our entities customer customer is one entity company, company, supplier, supplier, management, management, purchase, purchase department, purchase department. So we have 5 entities now, please understand once again customer is fine, supplier is fine, purchase department is fine, management is also fine but company should it be an entity, no sir, no sir should not be because you are modeling the company itself. So everything is happening inside the company all right, the all the company's activities are already being thought of.

So usually that is why the word entity is called an external entity, is it all right. The word external entity is used because of that so we need not separately keep company as an entity and then it is a context diagram, so there should be a single process that is the may be buying and selling process. We can name it buying and selling process and what are the different file, files or data stores what are the different data stores that we should have yes, first one is inventory stock or inventory then, sales statics we should have then customer history, customer history we can have supplier details, supplier details we can have pending orders, item details, you see all these are to be there. In fact the customer details should be there in 2 files, can you tell me why cannot we can keep all the customer details in a single file. Actually what happens see whenever you keep customer information there are two parts of the customer information, one is the details of the customer and another thing I mean customer name, address etcetera, etcetera what kind of

items he purchases and how frequently he visits etcetera. General details about the customer, it is not static that way I mean it can change other one is the customer details basically, details of each purchase.

So you can see that some of the fields, some purchases he may be paid immediately, in another purchase he might have been a very bad pay master all right. So what you can think of that in the first case where he was very good with your payments and the second case where he was not good at all has to be keep separately in the same field, credit worthy, credit worthiness field if you perhaps keep. You cannot write both are simultaneously, cannot write very good and again write very poor, you cannot write in the same field. So you have to have two sets of record basically for every customer, you have to have a number of records for every purchase that he has made is it all right.

So there the customer number will not be an unique key rather customer number and the purchase number together will be an unique key. all these things will discuss while we discuss the data base management systems but as on today you just understand that there has to be 2 data stores, one for the customer usual customer details like name number etcetera, etcetera another is his purchase history where customer wise we shall keep history of each purchase, clear.

So this is the context diagram and if you really look at it, we have the buy and sell information system and this buy and sell information system has got customer then management, supplier, purchase department, purchase department generates items, request and customers places orders rejection messages are coming invoice, delivery advice, send to the customer, management makes queries and obtain statistics, purchase department item requests and item orders are given to supplier delivery side has not been modeled, there should be supplier is giving delivery all that thing that is not modeled in this particular case.

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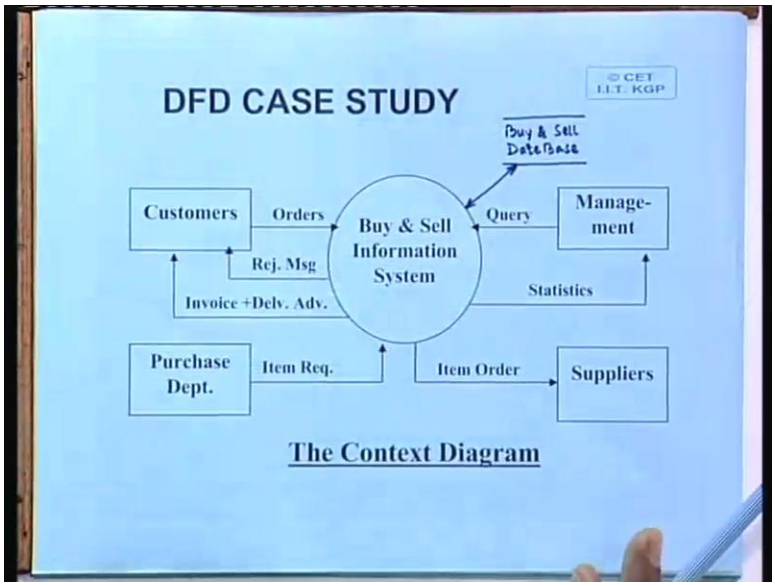

Now these context diagram is not complete because this diagram does not show the data stores, data stores all right, you should also show data stores. In fact what happens in most of today's context all these data stores are to be actually included or combine together as a single database right. So you can just show, just a database buy and sell database and it is connected right. So this also could be possible, we can show right. So you can just show buy and sell database and this information system has a connection to this database right. So that is about your context diagram. Now after your context diagram, what we need to do we have to identify individual processes out of this buy and sell.

Now what are these individual processes just refer back to the discussions that we have had on the basis of these discussions, we should be able to find out yes, now you see what you can do instead of trying to focus on everything at one go you can actually think of one by one say, for example credit worthiness then checking item availability, checking inventory all that thing you can combine, you can combine, is it not, instead of thinking that we shall have separate processes for that right in the beginning, we can keep it to the detail, keep it to the detail all right.

So we can just say that we have a particular thing called accept order. So the first process could be looking through various files, like your item files, like your customer history, inventory files and basically based on your result you accept the order. After you have accepted the order then you should place order is separate, see place order that that is a separate order that is a purchase order, this we are talking about customer order. See that is why they stock basically in a supply chain process, what happens you have the customer side that is basically called inbound logistics and out bound logistics. The inbound logistics is when you have a connection with your suppliers, outbound logistics is you have your connections with your customer.

Now between the inbound logistics and inbound, outbound logistics that additional thinking was you should decouple them as much as possible and how was it done through stock or inventory. So that if you maintain some stock then you need not worry about inbound logistics to come in all the time while you are thinking of outbound logistics, right. But unfortunately, what has happened because of these thinking, the most of the companies today are basically plagued with huge inventories right. Any company which does not manage this logistics process properly, they actually in order to be play safe, they build up huge inventory and there are no shortages right but a but again if you have more stock that means you are keeping more money blocked which you could have used otherwise, all right and if you keep some money blocked essentially the money is not moving and you are losing in some way or the other.

So because of these increasingly people are thinking, why cannot we make our two logistics work together both inbound and outbound, why should we not couple? Couple in the sense that the supplier should also be connected or supplier should also know, what is happening on the customer side and the customer side should also depend to some extent on the supplier performance that is actually supply chain management. Now these are some new concept that has come basically to connect say for example, when you are let us say you are a buying and selling company, you are expecting some huge orders from your customers. Now if you do not inform your suppliers that usually you takes 500 units per month, next month you will require 5000 units if you do not keep your suppliers in confidence beforehand, what will happen if you order in the usual manner.

Suddenly, next month you give try to give him 5000 orders, what will happen? He will not say no, he will say yes but then he will not supply he will try last moment 100's of things and probably will not be able to supply properly either he will give substandard things or do something or the other. But, if he would have kept him in confidence 3, 4 months in advance that look I will be requiring more than much more than 500 in these particular month probably 5000 and since you are my valued supplier, most likely I will give the order to you. Then, the supplier could gear himself prepare himself for these kind of eventuality, what will happen you will build a proper trust with supplier not only that you will not suffer the difficulties that you may face if the supplier fails to supply, all right.

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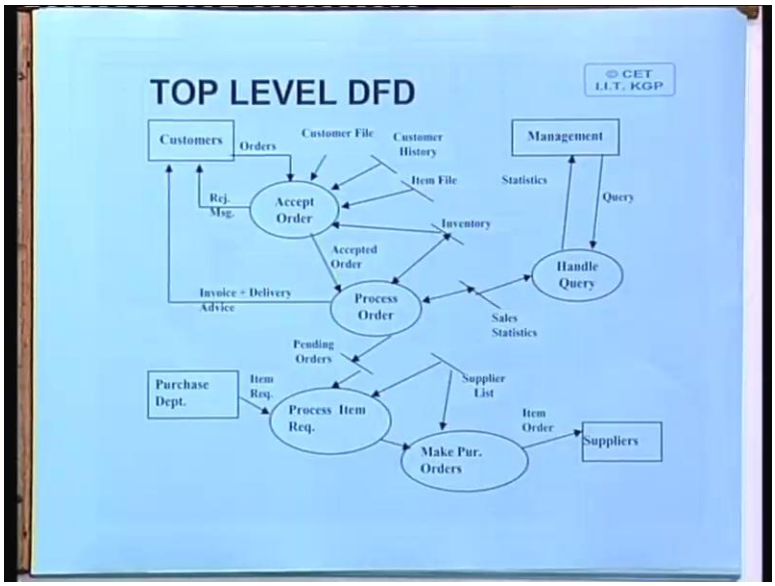

So these kind of interconnections people are increasingly thinking of that is the basic idea of supply chain management all right. So this is how the customer ordering and supplier ordering processes are actually related but here for the sake of simplicity, we are not going into that details right, what may happen if you have those supply chain coordination then your customer order history should also effect your purchasing process all right. The purchasing process equation should be little bit more involved. So broadly our top level DFD would look something like this, we will look something like this.

We have various processes like your accept order, accept order then your process order, process item requests make purchase orders handle query all right. You do not try to draw the entire thing will come back to this diagram just this, the purpose of this diagram at this point of time is simply to show you the broad processes. We have the accept order process, process order handle query for the management, process item requests make purchase order. So this is the broad process of the top level DFD, I will come back to this diagram later on. Let us see these process step by step, this is the first process that is the accept order all right.

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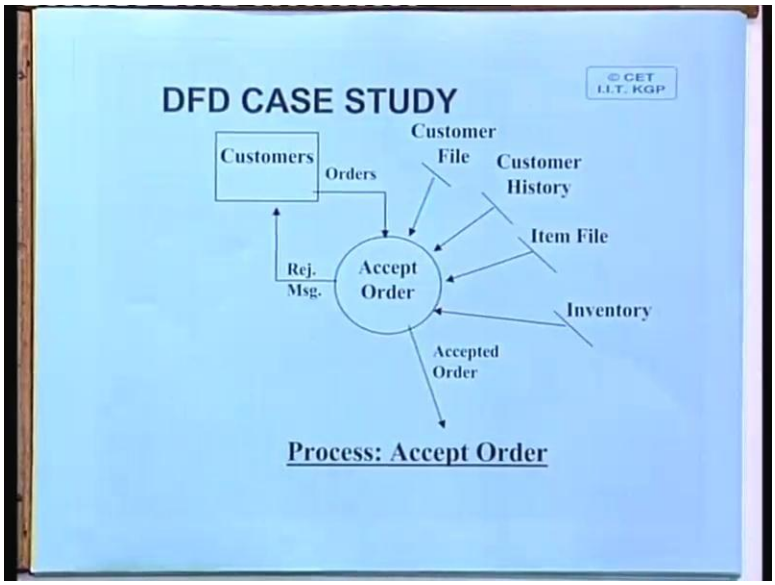

So what is happening here, the process order you can see that customers are placing the order, the acceptance process involves the customer file, the customer history file which lists all the old purchases of the customer. The item file, what are the items the company deals with and this is the inventory actually, we can combine probably item file and inventory because item file is nothing but what are the items that the company deals with and inventory is for each item how much inventory is being held and if it is accepted then the accepted order goes to the next process right. So this is the accept order process.

Now later on we shall come back to this accept order and we shall see, what are the detailed you know processes of the accept order. So you can see these in some more detail. Now let us come to the next process that is the process order. In the process order, what is happening we have the inventory.

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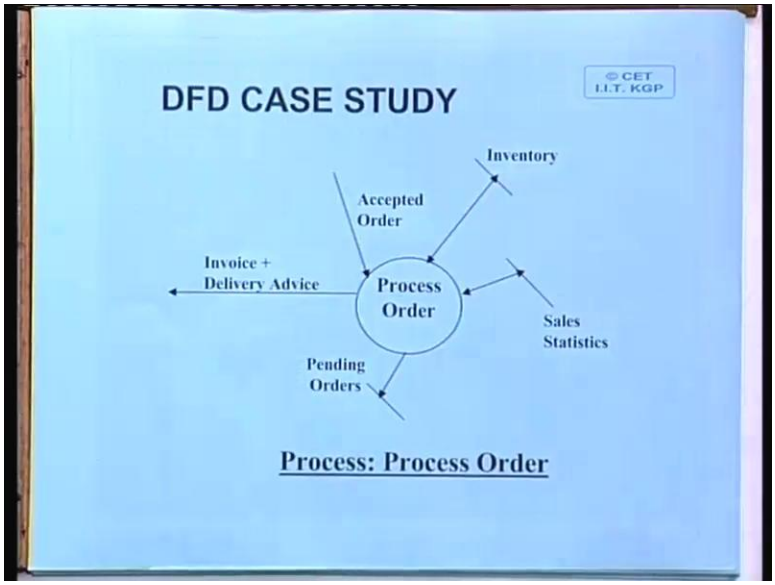

See accepted order which is coming from your customer side that is the accept order process, this is the input then you are checking against inventory, you are checking against past sales statistics that will come later then, after your processing basically at this point you are checking whether sufficient inventory is there or not, if yes then send invoice and delivery advice to the customer and pending orders otherwise and also generates sales statistics if the sale has actually taken place.

So as you can see there are some time ordering, there is some time ordering here the whether you should keep it in pending order or whether you should put it in the inventory that will depend on what is the outcome of the accepted order. See, you can see that while I am showing individual processes, I am not drawing the entities again, I could have drawn the customer as an entity but because it is obvious, it is already shown in the overall top level data flow diagram. So when you

are actually at the detailed data flow diagram level, it is sometimes not necessary to show the further details basically this is our focus area.

So in this focus area we need not show each and every detail which is beyond this. Then, these are the supplier processes, the two supplier processes, number one is the process item request. So we have from the purchase department the item request coming in the pending orders, the supplier list and see, what is happening at any point of time you are looking at how many orders are pending all right, who are your suppliers.

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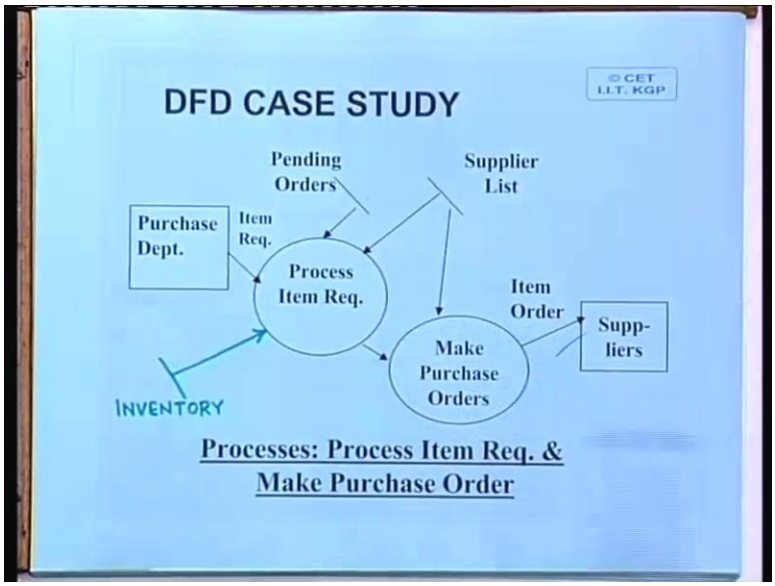

So here it is assumed that when your item request is made obviously, you must also check the inventory. So you check the inventory, you check the pending, how many orders are pending, who are your suppliers and process the item request, make purchase orders based on the supplier list and send the item order to the supplier. So this is the purchasing process, as you know already that if you want to go deep into this if there are a large number of processes that are could be involved. Basically, asking for quotations, comparison of the quotations, make a comparative statement, place it to the management, take budget verification, financial

concurrence, administrative approval you know, so many things could be there or may not be there.

Suppose this item is a regular purchase, so administrative approval is automatic, financial concurrence is automatic if the budget is there that is also automatic. So you can just if you even have a rate contract, you can straight away place purchase orders. Otherwise, you may have to have such a complicated structure and then send the item orders to the supplier then, the next one where you have the statistics handling.

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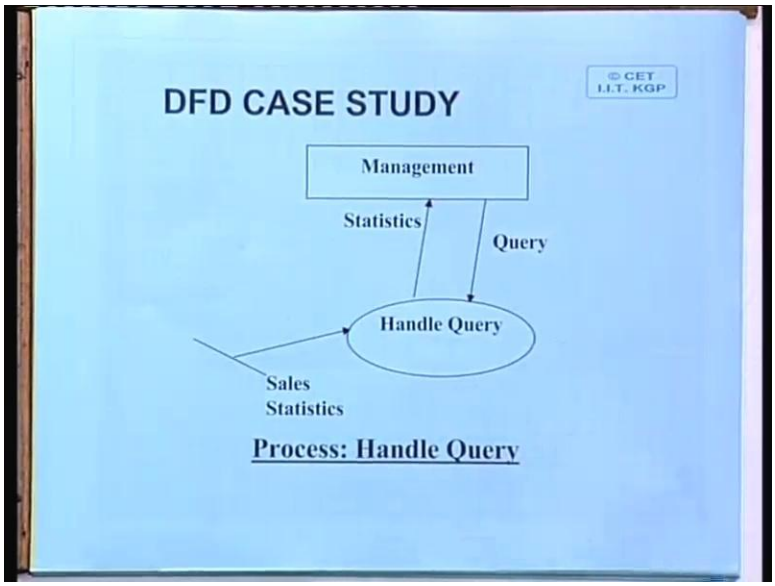

You have the sales statistics, you have to have the handle query, the query comes from the management and you are giving the various statistics for management decision making right that is the query handling process all right. So again various kinds of queries could be there as I have told earlier and usually you know this query are what happens particularly from an implementation point of view, usually we use what is known as structured query language, SQL right and as far as possible if we could make a very generalized way of defining the structured query language then it is not necessary that you have to have pre specified programs because try

to understand there could be 100's of different types of statistics which may be available all right.

You may have to it is only sales statistics but management may like to know about all the all the database file about the suppose a given customer has a has a very important customer for you all right and that customer was also paying very regularly. Suddenly, he is not paying so the management wants to know the recent history of this particular customer last 5, last 10 purchase histories in some detail then if by using some very simple statements making use of structured query language, he should be able to get it very quickly, fine.

So these are some of the things then let us come back to our top level DFD once again. So what the top level DFD does it puts everything into the perspective right we have the customer, we have the orders, rejected message, customer file, customer history, customer file, I think you have to have this line then customer history, item file inventory then accepted order process order along with the inventory and we have the pending orders invoice plus delivery advice sent to customer then item request are processed by the purchase department using the supplier list make purchase order, send the item orders to supplier using the sales statistics, we have the handle query and query is sent by management statistics is given to the management. So this is the top level data flow diagram.

Now let us look at one of the process like accept order and try to see what should be its detailed data flow diagram right, the detail data flow diagram actually may look something like this that is we have the customer, customer is placing the orders and you first do, what is known as check credit, the credit check.

Now will require the customer file as well as customer history to be used and the based on these if you have a rejection message then, you can send the rejected message. Otherwise, the credited order will go as a thing and you can go for check items and the rejection message, you can send to the customer. Similarly, the check items will be checked against the item file and the checked order will go to accept order face where you are checking against inventory and you are accepting the order basically what is happening, when you are checking against inventory at this

stage all you are trying to see whether the inventory exist for this. It is not a detailed check where you are making it pending actually all right.

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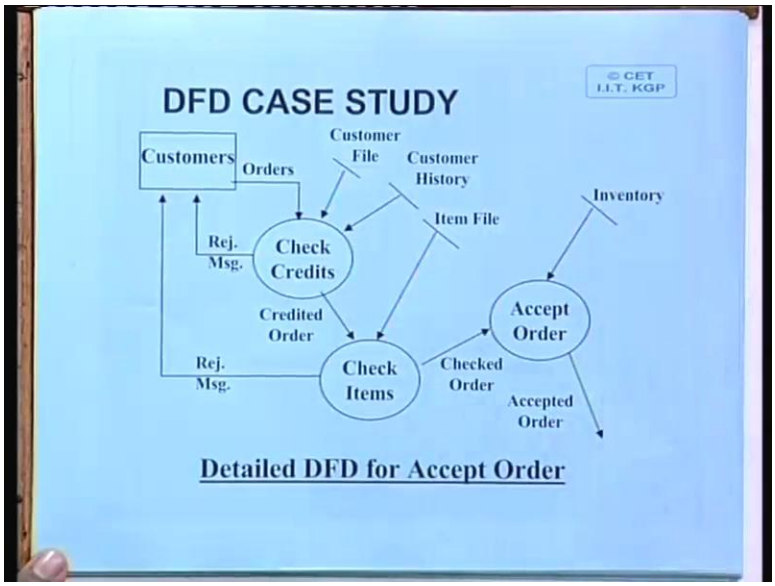

So then accepted order goes further. So you see again as you have seen that while drawing a detailed data flow diagram it is there is no sacrosanct rule that we have to divide them into 3 components there is nothing sacrosanct about it you know somebody else may just put it into 2, put it into 2, somebody else may think that this is such a simple thing that there is no need to have three different you know processes all right.

So it is you have to use your your discretion and based on the discretion you have to come up with a particular structure all right that you must remember that the data flow diagram is a subjective diagram, your diagram need not be same as another person's diagram. So this is what I have drawn you may not draw like this you may draw slightly different structure. So some of the important questions that come up to our mind is consider the detail DFD or accept order all right.

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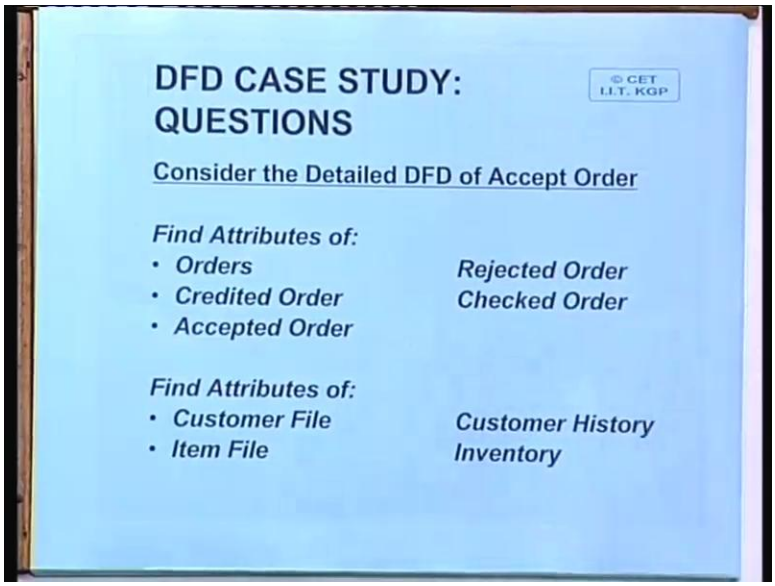

Then, what is required is find attributes of orders, credited order, accepted order, rejected order, checked order. So we need to find the details of all this, what should be basically the details of the orders, yes customer name, then date every order we should give some order number, see customer may not give an order number may not or they may give also see depends on the type of business. Suppose, your customers are essentially the consumers, they will not give any such number but if it is a b to b, I am sorry company to company, I am sorry business to business that is b to b type of thing then, naturally they will also give a number but irrespective of whether they give a number or not you should always give a number, all right.

So when you receive a customer order, every customer order must have a particular order number then an order could be for multiple items, need not be for a single item. So each item should have an item number, item description, item quantity etcetera, etcetera. Then what is a credited order we can have as field credit checked yes or no then rejected order, this is like a slip which should have the customer number, some reason why it is rejected all right and reference to the order, checked order, what should be there in the checked order. It is should have both credit worthiness field flag as well as the item check flag both should be ticked apart from the usual order details, all right.

So accepted order is even further where you should also have apart from these two checks credit check and item check, it should also have an inventory check right. Then find attributes of customer file, item file, customer history and inventory, what are the different attributes? Customer file, customer name, adders, number, number should be first, number should be first then, what are the items that the customer actually buys in general preferred items all right general history, credit worthiness etcetera, customer history all the past purchase details about the customer, item file, list of items essentially nothing else nothing much that inventory should have many many more items for example, item number, item name then, description present stock then reorder point, safety stock, etcetera, etcetera. So the history of the item that should be there then next, what you must do you must have for each of this processes of detailed DFD or accepted order whatever we have done.

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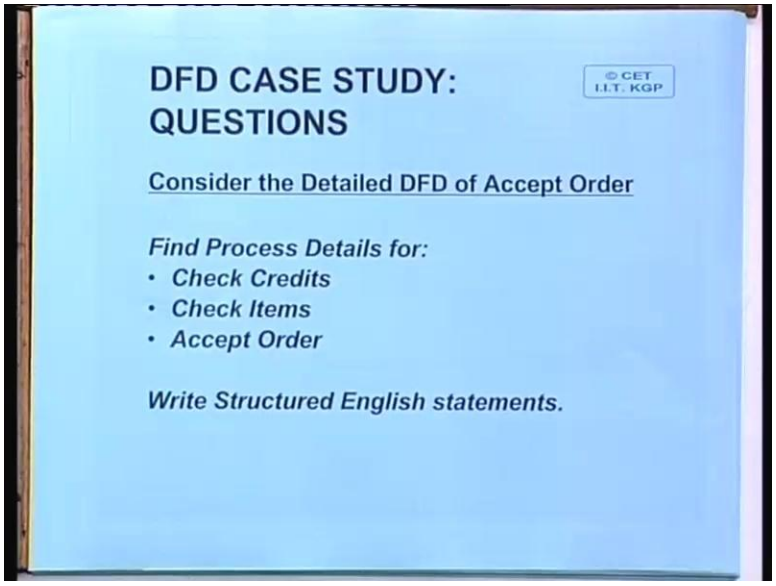

We have to have we have to write process specifications all right. We have to write process specifications for check credits, for check items and for accept order all right. So how to do it by using structured English statements. These we shall not cover today the structured English statements, we shall cover from next class onwards which would be our next topic that is decision analysis all right. But, today let us cover just as a last topic a concept called data

dictionary, see data dictionary is a concept which essentially talks about a collection of data element definitions. See, as I have said that customer say customer file then, it should have customer number, customer name, etcetera, etcetera right.

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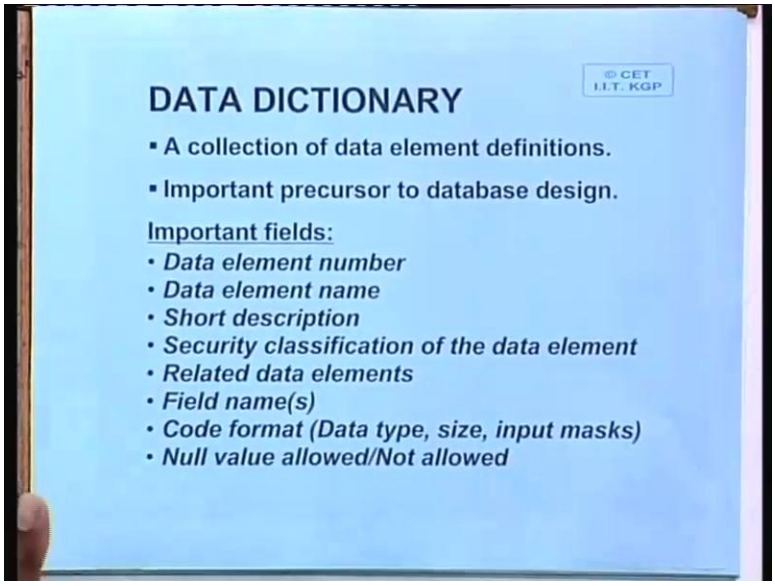

Now each of these are actually is a data element but what you must do against each of these data element you should have a complete data dictionary, what this data means. So there should be a host of things for example, what is the number, data element number it should give an given number, what is its name it should have a short description say for example, customer name what do you mean by customer name.

So it is a name of the customers right something like this it could be a company also need not be somebody's name then security classification of the data element, sometimes the you may required it that you know how much secured this data element should be, should it be openly accessible or should not should it not be, what are the related data elements. So basically all customer items customer related data elements are related to it. Then, individual field names actually here we are thinking that the customer name need not be your see, it is it is like the complete customer you know, it is not really just customer name.

So all attributes of customer we are putting towards it all right. So basically, so therefore customer number name etcetera all should be coming under that then, a code format, format means what is a data type so for customer name we may say that it is a stream type, it is a stream type, what should be its size, sometimes we have seen that we can give a size of 40 or 100 or even more depending on the size. If you want to keep just a short name 25 is enough but if you want to keep a long name not really too big then we usually take 40 but if you think it could be really big then you can take 100, these are the usual way people take. The input masks is something else the input masks is in some of the languages, you can actually give some kind of input mask for example, in C language in the printf statement you can give something between two codes, percentage d, percentage s, percentage point, something s you know it basically defines how it should look like when you print it, all right.

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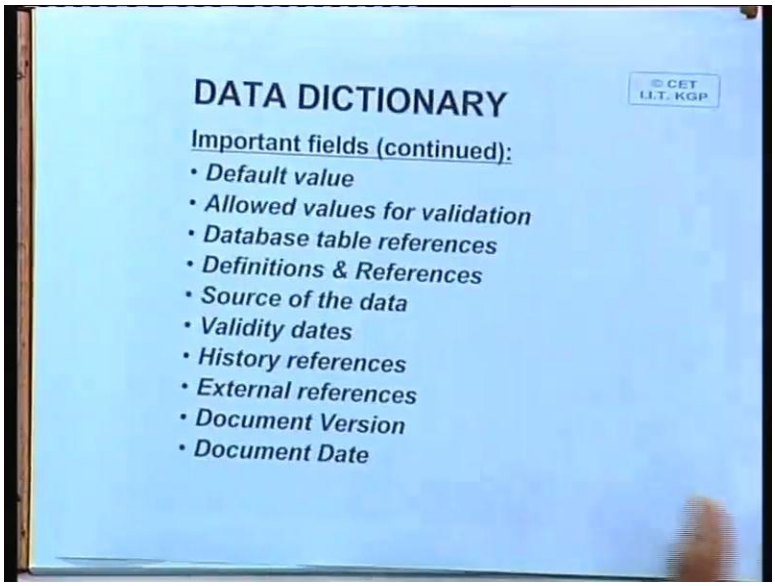

So when you print this particular field whether it should print left justified, it should remove leading zeros all right or it should print right justified that is actually an input mask then, whether you will allow null values or not allow, many a time this could be an very important question. Suppose, you say that null values allowed that means this customer name has to be provided whether you like it or not, if you do not provide then it will not go further.

So this will be our last slide then what is the default value? Does it have a default value? Sometimes you can keep a default value all right and what are the allowed values for validation. See, see suppose credit worthiness credit worthiness could be yes or no, it cannot be anything else or maximum you can keep not determined right. So yes, no, Y, N, U, these are the 3 values, default values could be known. So default value is known and there are 3 allowed values Y, N and U fine, then data base table references which database table, it is definition and references, source of the data, validity dates, how long will it be valid some history and external reference and finally document version and date, okay.

So that is what should be part of the data dictionary and one should really prepare good data dictionaries for all the items, all the data fields and accordingly work around it, right. So we complete our DFD discussions here, if you wish you can take up other portions of the DFD and try to draw data flows diagram, develop process specifications, derive data dictionaries, all right and have more exercises. Thank you very much.