Object-Oriented Analysis and Design
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Lecture - 30
Identification of Classes, Objects and Relationship in LMS (Contd)

Welcome to module 18 of object oriented analysis and design. Starting from the last module we have taken up the task of doing an exploratory exercise to design our leave management system. So we will continue on that task over this module as well. So as I had advised in the last module 02 please keep the document of the LMS specification the PDF handy keep the video handy.

If you need clarifications, please watch the video again and please also keep pen and paper with you so that you can pause in between and complete parts of design that I am discussing in this module. So here we will primarily again quickly recap what we did how much part of the design has been done primarily the identification of classes and their attributes have been done.

And based on that this particular module we will focus on the identification of responsibilities and as we had been doing in the lat module we will continue to do periodic quality checks to make sure that we are actually refining it for the better. So just to remind that our specific input is the English specification, informal English description and we are trying to make the class attribute and responsibilities.

So this just for a recap again that this is a kind of a specification that we are following you already know this. Now in the earlier module we have followed a primarily a linguistic approach for analyzing the English description based on that identification of nouns and we have done that analysis. We have identified a whole lot of nouns of the order of 50 different nouns.

This is possibly the complete list there maybe few more which you may be able to identify and then analyzing as to which nouns just occur as values we identified some of the attributes of course there are lot more attributes which need to be completed by you and with all this after the stages we quality check to see that the coupling in the system is still low because it

all disintegrated kind of some kind of cohesion has started coming up in terms of similar items which we are putting down in terms of classes.

And sufficiency is not clear and completeness and primitiveness is also very low and with that we identified about 15 potential classes there would be more, but these are the potential classes, these are the key abstractions which stood out from amongst the different nouns that we had analyzed.

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Now having said that now we move on to the identification of responsibility and we will continue with the linguistic analysis approach and this time we will focus on the verbs to do our task so it will be like this that we will use the linguistic analysis and try to extract verbs and naturally verb as we can understand verb inherently gives a sense of action, it is a sense of something being done.

Nouns have more strong correlation with existential realities and therefore are more indicative of objects and classes. Verb would be more indicative of actions, but there would be exceptions in some cases verb may actually stand for a connective may actually mean a property and so on, but primarily from the verb which we will try to see is what operations can be executed by a certain object.

We already have made a good understanding of the possible objects by the identification of classes and we will try to take into account from the analysis of verbs as to whether there is reusability that is if the same action or very similar verbs are repeated amongst various

different agents then those are potential places for reusability which we would like to identify.

We will try to see that naturally actions mean events we talked about events for structural clustering also you will remember while we were analyzing for the classes. So the event is some happening so we will expect that with the identification of verb we will be more clearly able to talk about what events are expected and when those events will happen and so on. The verb naturally in many cases will have a subject and an object in the linguistic sense in the grammatical sense.

So from the object of a verb, we would be able to understand, we will be able to extract what is the expected object of the (()) (06:08) on which the verb is the action is actually being taken. So we will get idea about responses the events raised in turn and so on. So the analysis of verbs should give us a quite a bit of good hold over what can happen in the system. So like before we just colorizing the text this time I am using the blue colour to identify the verbs.

So the company wants to manage the attendance and leave of its employees through LMS. This is a verb, but we would simply ignore that because we understand this is just a verb for expression not for the system, but here is a verb which has specific subject of employee the verb work then report again report then there is approval approve, there is regret again report approve and so on.

So in this way we can see like in the case of noun we can identify several verbs that will be off use in terms of the identification of the responsibility. Continuing on that document further if we go towards part where leave different kinds of leave are discussed we can say that we see a verb credited. So we will know that leaves will have something to do with the credit system.

It has something to do with the joining in other verbs allocation is prorated so there is another verb that defines actions carried over or carry forward is another verb and we can see that there is some qualification in terms of that. So when we analyze verbs we can actually see that what is a primary verb and what are the auxiliary one. The primary is a carry over and the auxiliary is cannot be which basically is a negative action that is being said.

So we can make a note of this all of this are of that kind and if you go through we will be able

to identify many of them in the whole document. So I hope you have understood again as to what we are trying to do in terms of analyzing the parts of speech. So I would strongly suggest that you pause at this point and go back to the PDF specification and go through it very carefully this time analyzing the verbs and connecting them in your notebook.

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So I hope you have done this exercise of collecting the verbs this is the list of the verbs identified from the LMS specification again I would never claim this to be an exhaustive list you may be able to find some more verbs that I have missed out, but this is more or less the kind of verb that you get. So there is interesting verb like approve, like regret like adjust and there are lot of as I said is auxiliary combined verbs the negative actions.

And certainly verbs which are kind of more connective like become and provide these kind of so all kinds of verbs actually come in as you do the analysis and you will also find that there are certain verb forms which are not in the pure form like these ones. So the pure original verb is a club then it is coming with an auxiliary extension. So what we will do just to clean up the system and reduce the number of verbs that we have to deal with we will try to just take the pure form and take the list of verbs which are in the unique terms of their stem.

So if we do that clean up then we are left with these kinds of verbs on which again we can try to look into couple of different things like what are the verbs that we observe in very core part of the action so maybe I could take a look at the specification here.

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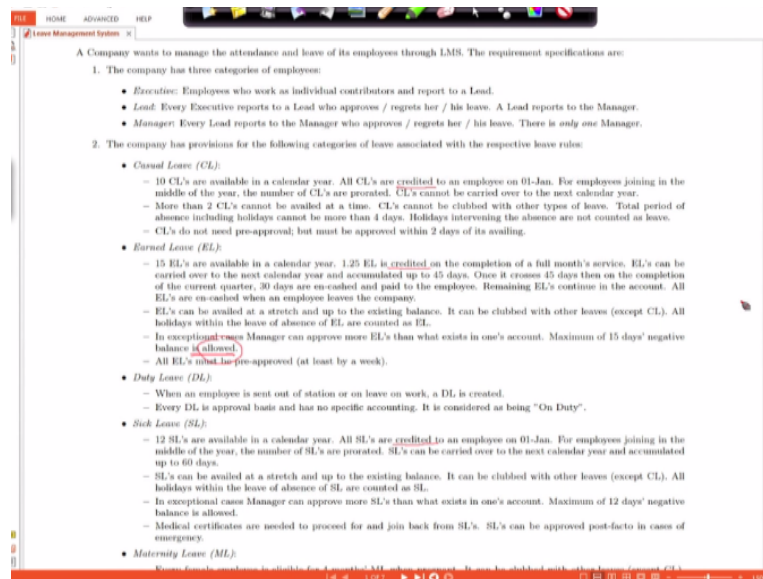
So if we look at this then suppose if I am looking into these leave parts and we can see that the verbs like the leave is credited, EL we are saying it is credited. So we get SL'S is credited. So you can see that it is credited as a verb or the credit verb has something strong to do in terms of the different leave which is understandable because you need to have some entitlement for the leave.

But some of them maybe relatively less important verb like here we are saying that maximum 15 days of negative balance is allowed. Now this is not this is though this is a verb, but you will have to be careful that in the usage here this is more a constraint then an action. Since we have to express everything here in English you are writing it in terms of naturally subject predicate object and verb and all that, but this is not actual an action of an agent.

This is you would not perceive an action here rather this 15 days negative balance is allowed is more like a constraint that we will need to get into the system.

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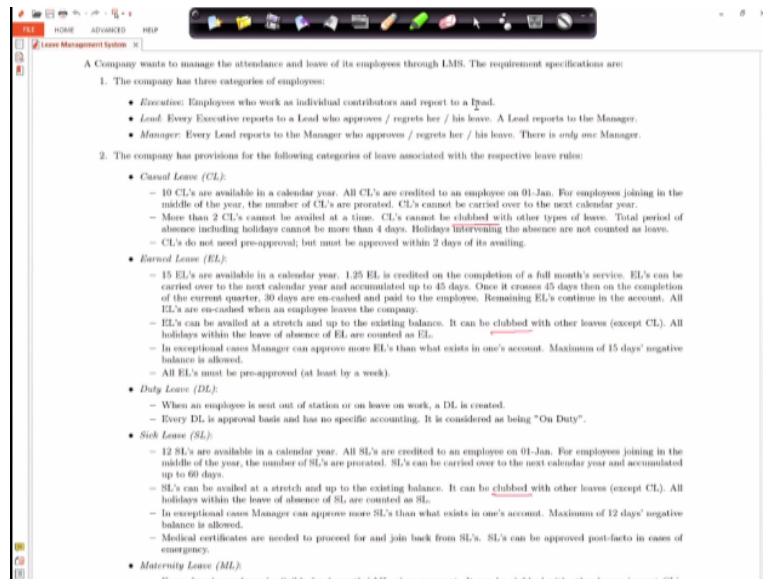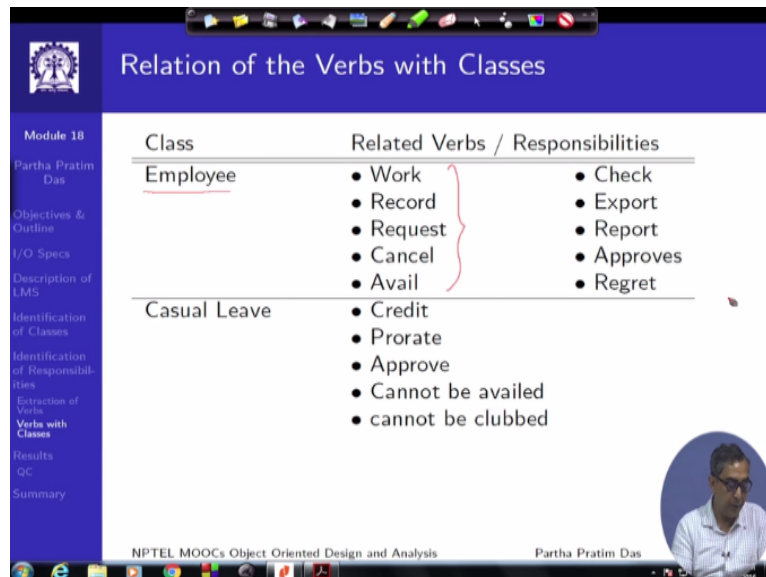
Whereas we could look into some of the other verbs like clubbed we can see that here in CL, we can see that here in EL, we can see that here in SL and so on. So all that have meaning is in fact if I just scroll down further in maternity again I am sorry your underlining will change because here the underline is actually on the display panel, but you can see that clubbed also exist in maternity. So we can certainly conclude from here that club is a verb which has a more of importance more of relation to the core responsibility and dynamics of the system.

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So that is what I was trying to point out here that is what I was trying to point out in terms of the list of verbs that we have here so from this list we will need to try to primarily identify in a manner that we were doing as to what are the more important, more relevant verbs for the situation that we have. And we will have to obviously keep this in mind that our core responsibility here is to prepare a leave management system.

So that by the basic definition of the problem most of the actions that are either initiated by leave kind of objects or where leave kind of objects are a participant certainly has more importance and we will have to looked into in greater detail.

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So with this let us move on let us now try to put these verbs with the classes that we already have the classes identified at least we have a reasonable number of classes identified. So what I am trying to do is actually analyze the document and trying to associate the class with the verbs that can get related to it. So this will mean that my statement says see, for example, here that it says that the employee who work so that relates these two together.

We say executive reports so that relates these two together. You say lead who approves so that relates these two together. So this is the kind of relationships that we are trying to set forth we already know the nouns corresponding to the classes that we have identified that is how we got them and we are identifying the verbs and from the verbs we will now try to annotate on this relationship to get a better idea of what the responsibilities could be.

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So we do this identification of work, record, request, cancel, check report and all these are the verbs associated with employee whereas the verb associated with leave will be credit, that is crediting leave, prorating leave getting a leave approved and so on and so forth. So if we just define that then these verbs we can now think of them as responsibilities and you will see that some of these are marking in blue especially these ones we know that there are multiple categories of employees.

And if you analyze on the document you will find that these are the responsibilities or these are the relations that have been mentioned for all kinds of employees whereas maybe this is approve or regret is relatively restricted maybe it just applies to lead or manager, but does not apply to executive. So in terms of generalization I will say that these are the more important responsibilities, more common responsibilities that we identify and we will try to put them together with the classes that we have.

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So this now brings us to the abstraction summary of our linguistic analysis. So we will say that we have key actions report, request, approve these are the key actions. So these are the verbs or responsibilities that we have identified and then we are trying to say that what is core key and what possibly is just supportive one let me just again go back to this and then try to show you maybe I can pick up some parts from the second page because I am always discussing the first page.

So we say that here the specification is saying these are the typical used cases which mean that use case is a term which tell us that how typically user will actually use this system, what are the different scenario actually through which he or she will use the system. So if we look in here we will be able to see more of the association between the objects and the responsibility.

So if we look at, for example, here say every employee of every kind can do the following from his or her account so that clearly relates to these are the different responsibilities that you have. Now we are saying that of all these we are trying to mark that these responsibilities of say record, request, cancel, avail these we are saying are more key abstractions via these are key responsibilities in contrast to some of the others.

So let us understand why are we saying so let me again scroll up suppose here let us read the leave we are saying that CL cannot be carried forward, CL's cannot be clubbed. Then say EL can be carried over then it says it can be clubbed. This says SL can be clubbed. So if we look into these club as a responsibility now naturally it will go to a responsibility of the leave class

or the leave objects.

But this is we would say it appears like more an auxiliary responsibility because this is a responsibility which will again not have a primary action in the system which as it turning out very loud and clear he is that employees apply for leave the leave maybe approved they maybe regretted and so on and then if approved avail of it they can cancel and all that in comparison to that these are also responsibilities and they are responsibilities of certainly the leave class and these responsibilities will possibility lead to refinement of the leave class.

This will possibility lead to different refinements in the class structure that we have it will possibly impose more constraints and that is a reason we will like to make this distinction and try to differentiate between what are the key actions and what are the non key actions so that is I just discuss this to explain that why we are putting this in a non key one and why these are the key actions that you have.

And besides that you may have a lot of auxiliary actions like is something has to be performed and so on which are basically not part of the core system, but is coming across because you need to finally express the whole thing in a English like language.

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So with that if we take back then some more at a very early level or design could look something like this we know we already knew that there are several classes and employee is a class and if we look into the exercise these are different attributes which are specified somewhere in the document for an employee name, personal details, designation, employee
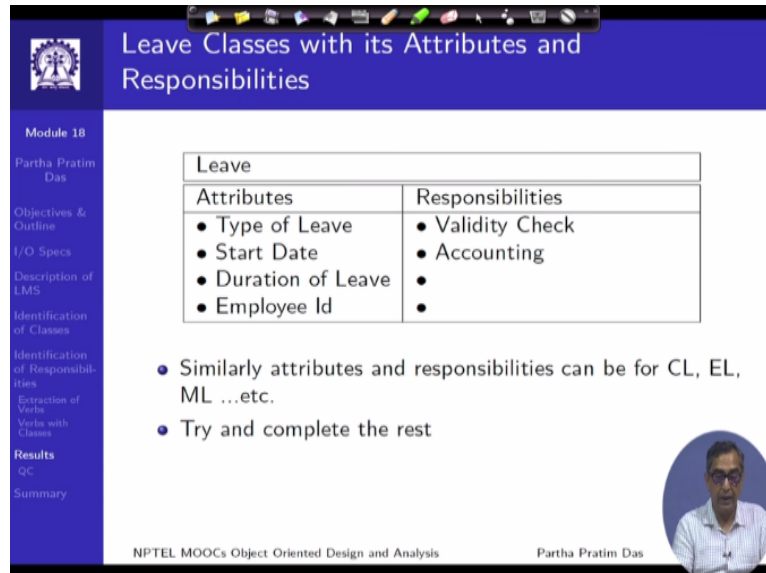
code, login ID these came up through the analysis of extraction of noun.

And then it went through the process of categorization, classification as attributes so we will have these attribute and these are the different responsibilities that we are being able to identify in terms of the analysis of verbs and then associating them as I showed with the actual employee class. So we have a collection of verbs, we have a employee classes and we can associate them based on what has occurred in the document where.

So this is a kind of employee class with attributes and responsibilities similarly we have executive, we have lead, we have manager all of these you need similar things to be done. So I will leave this to you and I will again advice that it may be a good option to just do a pause and try to work this out for the other kinds of categories of employees as to what their attribute should be and what their responsibilities, how their responsibilities turned out to be.

Going forward in later modules we will actually use that information and do different refinements of the design.

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This is just another example of the leave class with the attributes of the leave like type of leave, start date, duration of leave and so on and other responsibilities like validity check, accounting, capability will come up and again I will request you to actually work out on the leave objects and try to for all the set of classes please try to complete the attributes and the responsibility so that you have a good hold in terms of the basic defining entities of the whole system.

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Quick time for a quality check again so if we look into what we have primarily added the responsibilities here. So we have not yet analyzed the interpretation of the classes in terms of the responsibilities which we will what we would like to do in the next couple of modules. So since we have not yet done that so there is not much that we expect to change in terms of coupling and cohesion metric they remained to be at the same place.

But my feeling was that we are slowly inching towards completeness we are still low, but at least we have completed one aspect of the system that for all classes we have identified the attributes and the responsibility. So at a certain level we have a basic notion about the system dynamics though we have not yet looked at relationship we have not yet analyzed how those relationships will impact the overall organization of the system.

We have some idea emerging for the sufficiency as well. So our next target would certainly be to explore different association, different relationships amongst the classes within the classes so that we can infer more information about the design.

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So in summary in this module we have analyzed how we can identify classes and its attributes and responsibility from an informal English description. We have primarily in this module and in the earlier one we have primarily used a linguistic analysis approach which is one way of doing it certainly there are several other ways that this analysis can be done, but what has been important is we have shown that at every stage it is critical to go back to the specification.

And also measure as to how well you are doing in terms of the metrics in terms of checking out how the different quality parameters are doing and then come back and refine that. In continuation we will continue this exploratory exercise and in the next module we will explore the relation and hierarchy within the classes.