Software Engineering
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Lecture – 07
Life Cycle Model (Contd.)

Welcome to this lecture. In the last lecture we had discussed about some basic concepts about the Life Cycle Models. And, now we look at some of the well accepted life cycle models.

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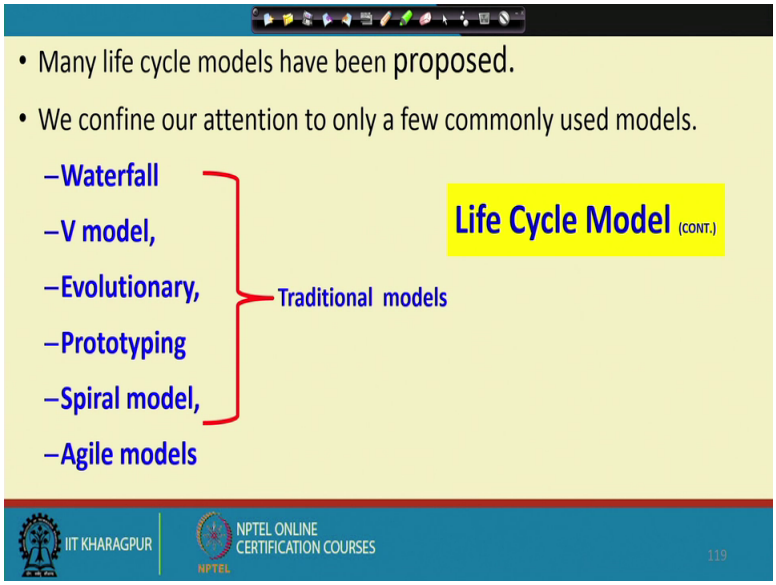

Many life cycle models have been proposed, the popular ones are waterfall V model evolutionary model, the prototyping model, and spiral model, these have existed for quite some time and we will call this as the traditional models.

In the recent years last 1 or 2 decades we have the agile models that have come into being. We will see the difference between the traditional model and the agile model why this came into being? Why these are become suitable for modern projects and so on as we proceed.

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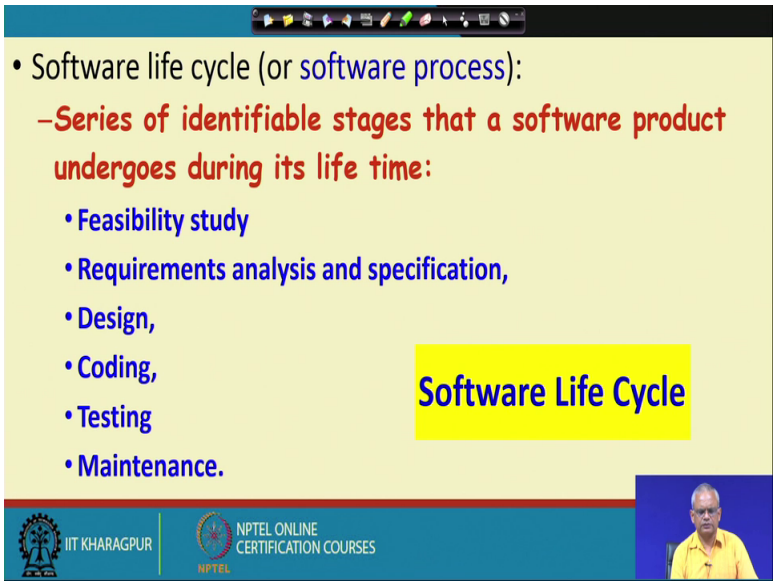

We have already seen that a software lifecycle is also called as a software process; it is a series of identifier stages of a software product undergoes during it is lifetime. So, if anybody asks that what do you mean by a software process need to answer, that it is a series of identifiable stages that a software product undergoes during it is lifetime, but then what are the stages?

The stages typically or most intuitively at the feasibility study finding out whether the work needs to be taken up, requirements analysis and specification, design, coding, testing, and maintenance. I think this is one of the very basic questions that can be asked on a software lifecycle that what exactly is a software lifecycle, and what are the stages in the software lifecycle.

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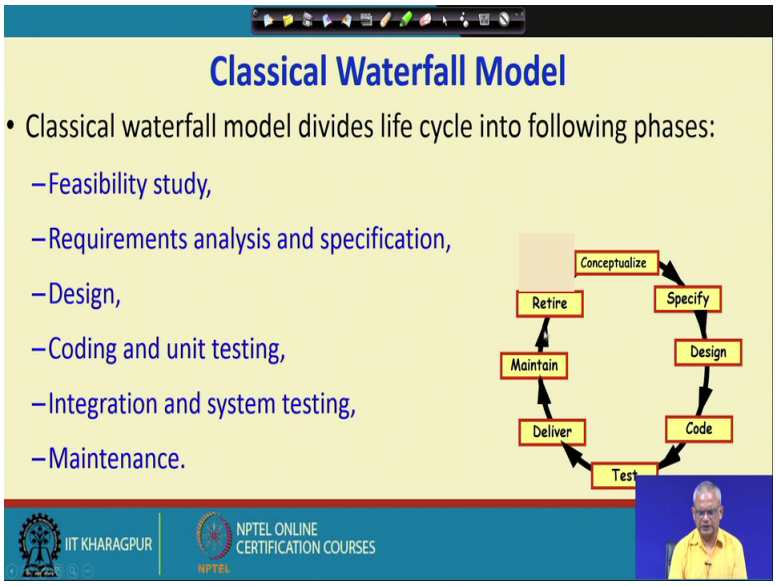

The most intuitive lifecycle model is called as the classical waterfall model. It matches very closely to the model that we had discussed in the last lecture, that intuitively if you ask somebody that how exactly software's have developed say that need to first specify. We need to design based on the specification need to code based on the design, then we need to test and after testing is complete we install it and then if there are any difficulties problems or their enhancements are required, then we maintain and finally, retire.

The classical waterfall model matches closely to this intuitive development style. Let us look at the phases here in the classical waterfall model, feasibility study requirements analysis and specification, design, coding unit testing, integration and system testing, and maintenance. Matches very closely to the intuitive development how the development should proceed? Initially do the feasibility study, then the requirements analysis and specification.

Then, based on the requirements do the design then code it and unit test, and then the next stage is the integration and system testing, and then it is delivered maintenance. So, this matches very closely to the intuitive model that we had discussed.

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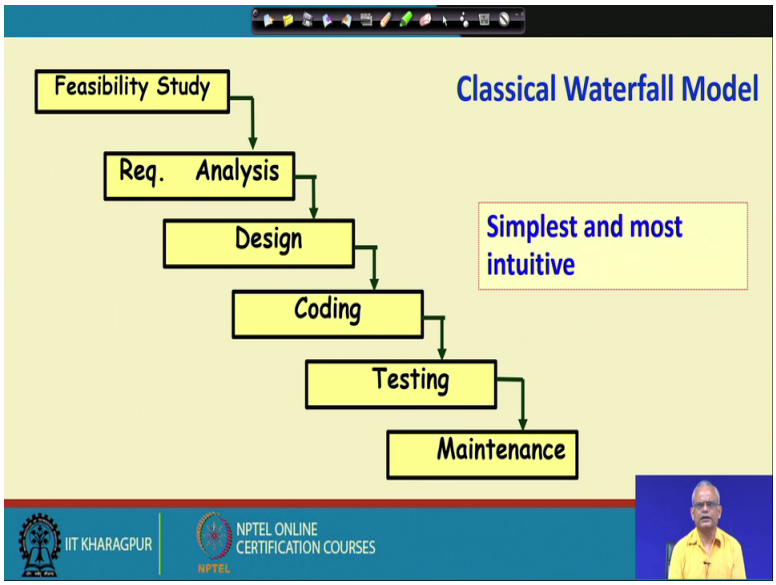

If, we represent the classical waterfall model in a diagram form we will have feasibility study this is followed by requirements analysis, that is followed by design, coding, and once coding is complete do the testing and maintenance. It is the simplest and the most intuitive development style.

But, then as you will see that even though this model is very easy to understand and all other models are basically if we understand this model, it becomes easy to understand the other models. But still this model is more of a idealistic model, it is not really used in real projects, we will investigate the reason why.

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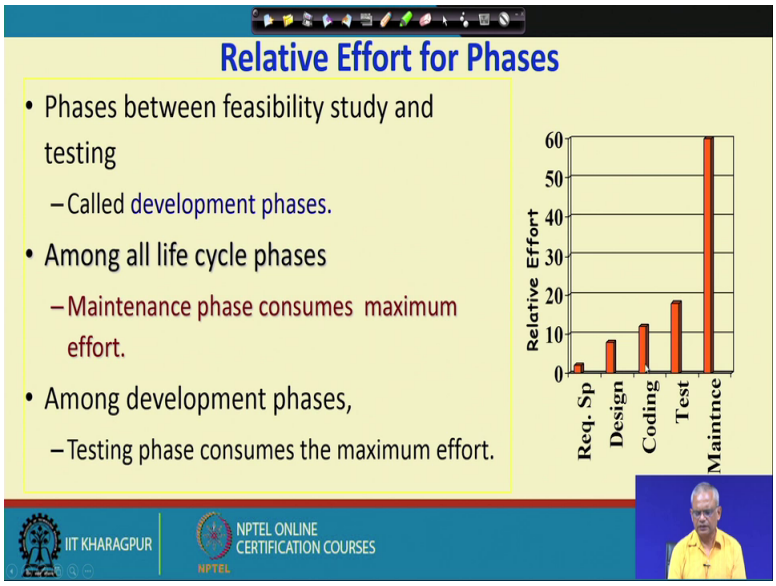

In the classical waterfall model, we saw that there are many phases, but then in which phase requires maximum effort. And, what are the relative efforts for different phases. Among all lifecycle phases the maintenance phase is actually the maximum effort, because remember that the development may complete couple of months are so on. In the maintenance goes on for years together and for almost every software the maintenance requires much more effort than the development effort itself.

But, among the development phases the testing phase typically consumes the maximum effort. If, you plot the effort for a typical project see that maintenance requires much more effort than any other phase. Because, it is undertaken for a long time the lifetime of the software, if we look at it, a very small time of the lifetime is actually the development time. And, it is used for much longer time and therefore, maintenance requires much higher effort. And, among the development phases, testing requires the largest effort, coding, design and possibly less effort on requirement comparatively less effort on requirements specification.

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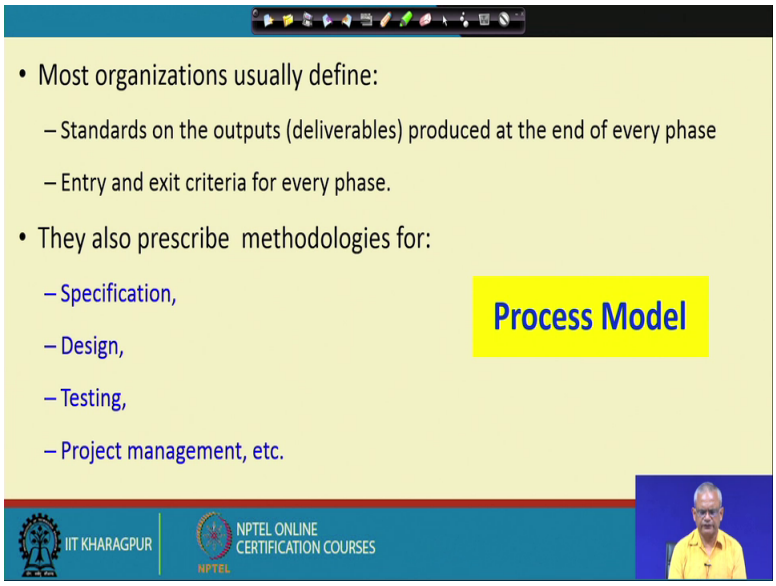

The classical waterfall model or any other model that is used to document such a model must not only have the diagrammatic representation, but have the entry and exit criteria, what are the methodologies that are used in different phases? That is how the activities are carried out specification, design, testing, what are the activities in that and how they are carried out? And also what are the outputs that is produced in every phase so, that we call as the process model.

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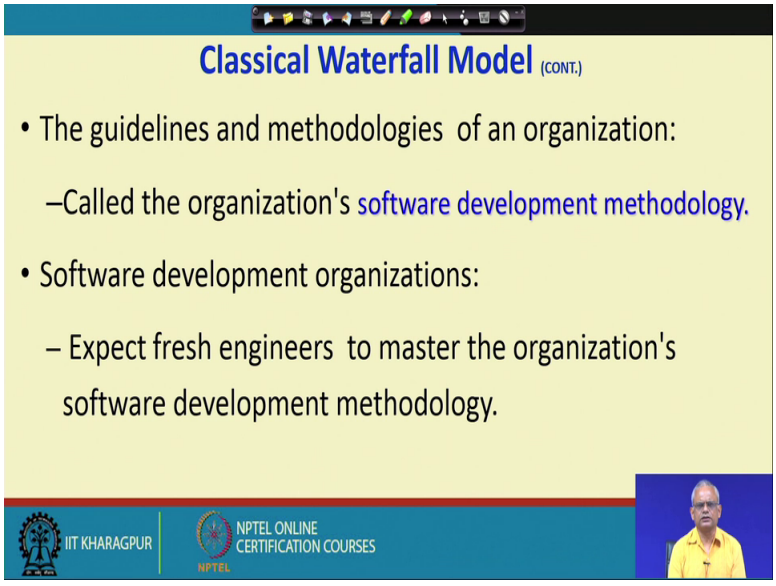

And, the process model we said that every doc good organization documents it is process model and gives it to all the developers. And, the new developers need to a master the development process, before they can start developing software.

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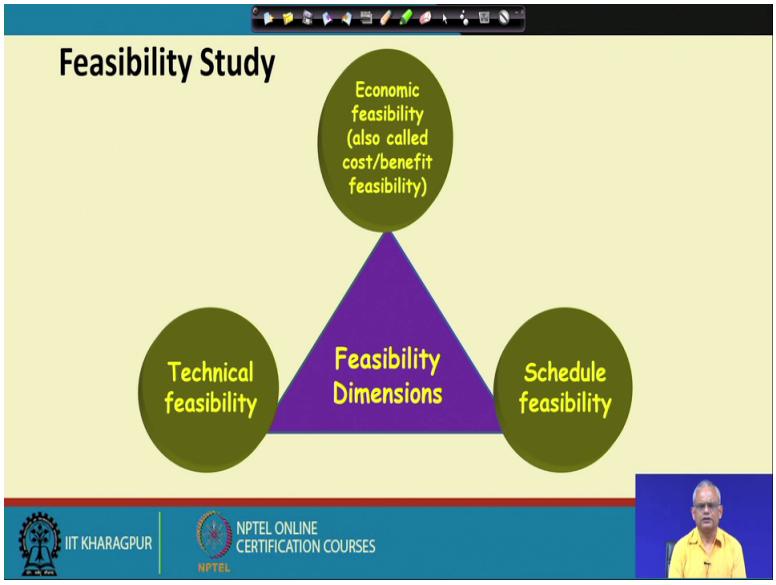

Let us look at the different stages very briefly, what sort of activities take place just to understand the activities. The first activity in the classical waterfall model is the feasibility study. In the feasibility study there are 3 main aspects that are determined, that whether the software that to be developed is economically feasible, that is whether the development effort and the cost that will be spent on developing software is it worth it.

It, is also called as the cost benefit analysis, technical feasibility that is whether the developing organization has the technical competence, required to develop the software. For example, some software that is being undertaken to develop may require, let us say satellite communication. And, the team members do not know how to use satellite communication write programs for satellite communication?. Of course, they will say that it is infeasible for them technically infeasible.

The third feasibility that needs to be determined during the feasibility study stage is scheduled feasibility. The time that the customer requires the product to be delivered can the development complete by that time. So, during the feasibility study typically undertaken these activities are undertaken by the project manager, he needs to determine 3 types of feasibility. Whether it is cost wise feasible the benefits will outweigh will be

much more than the cost incurred, the technical feasibility whether it can be done and the scheduled feasibility whether it can be done in time.

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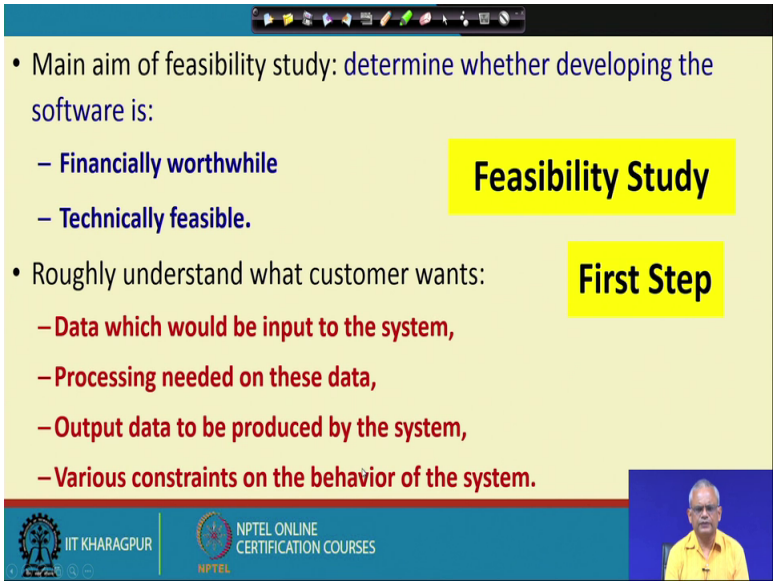

Whether, the software will be financially worthwhile, whether it is technically feasible, whether it can be done within the timeline, but let us see how exactly the feasibility study can be carried out? The first thing is to roughly understand what are the requirements of the software? What it needs to do?

So, that is the first step understand, what the customer wants, and to understand what the customer wants we need to understand, what are the features of the software? That is what sort of data will be input, what is the volume of this data, what is the processing that needs to be done on this data?

And, this basically becomes the code to be written. And what are the output to be produced by the system? And, then what are the various constraints and the behavior of the system? For example, whether backup needs to be kept whether the downtime requirement is very high and so on or whether the data to be input from different locations of the company and so on; so, these are the different constraints.

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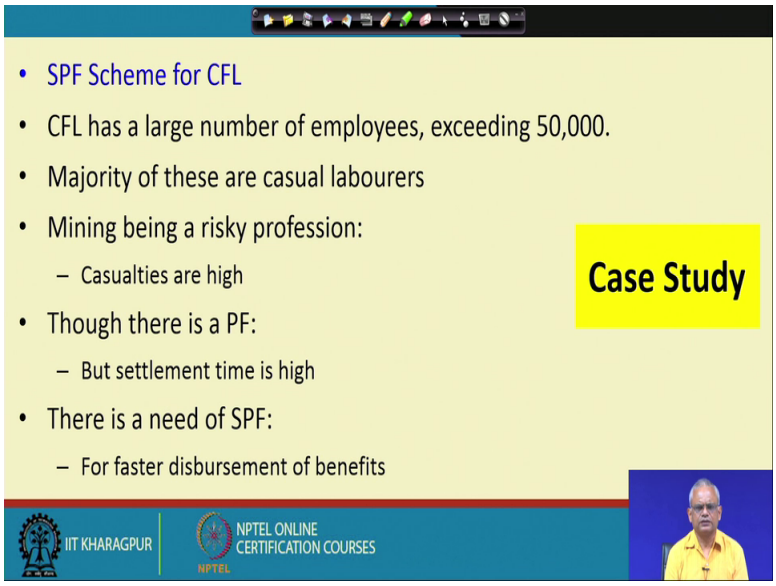

And, once the requirements are understood, then the project manager like to find out that how exactly to go about doing it? So, that is a proposed alternate solutions and then find out the cost for it is solution, do the cost benefit analysis, check whether schedule wise it is feasible and technically feasible. And, then find out the best solution and then discuss with the customer and determine whether to go ahead or abandon the project.

Let us look at a case study, that will help us appreciate what are the work or the activities that needs to be undertaken during the feasibility study fails. Let us take a project of the special provident scheme for the coalfields limited, which is a large company having large number of employees exceeding 50, 000.

Now, the company has many casual laborers and it is a risky profession mining is a risky profession, casualties are high people get injured killed even though there is a provident fund, but the settlement time is high. And therefore, the company feels that it needs a special provident fund we are faster disbursement of the benefits can be done

Now, invites software vendors to develop software for the special provident fund scheme. Many companies so, interest and then the project manager comes over visits the main office of the company finds out tries to understand, what are the functional it is required?

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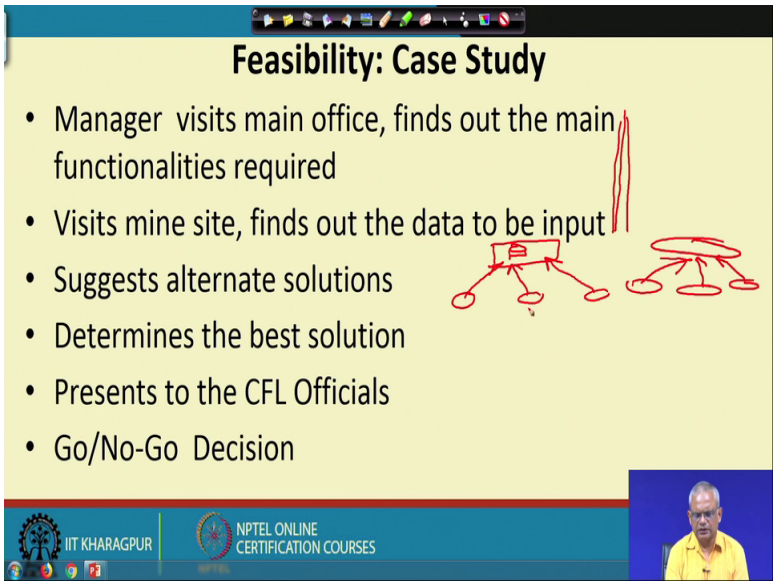

So, maybe it has to keep track of how much contribution is made by each employee? There is a formula for how much compensation to be paid? What are the restrictions on the compensation under, which conditions compensation will not be paid etcetera etcetera.

And, then the manager visit some mine sites finds out how the data will be input and what data will be input, that is what are the details of the employees, that will be input which will be stored somewhere. And, then what is their contribution on a daily weekly or monthly basis. And, once if understands that what exactly is required tries to propose alternate solutions.

The alternate solutions may be that proposes the data to be maintained locally at the mine sites and only periodically the data to be transferred to the main office. So, there will become computers at the mine site, which will maintain the data it is mine and there will be a main computer main server at the head office. And, then here the program will run and depending on the request it will provide the answer.

But, the other solution he might think of is that the data will be transmitted as soon as it is entered or maybe at the end of the day to the mine site, all the data will be maintained at the head office. Instantly result can be provided the up to date result is available whereas, here the communication costs are less, but then there is a delay and data is not up to date at the main office.

As, to do a cost benefit analysis for each alternate solution, find out what is suitable to the coalfield officials and then find out the cost for it is solution and then determine the best solution and check, whether that is acceptable to the organization. Whether there is technical competence to develop the solution and whether it can be developed within the timeline, and based on this the end he would take a go no go decision.

Just to summarize the first thing is during feasibility study, the work needs to be understood, what exactly are the features required? What are the data how they will be input? What is the processing need to be done? What are the constraints and so on? And, once rough understanding of the requirements is done, then find out what are the best ways to solve it and there can be many alternate solutions.

Examine, what are the cost implications of different solutions, find out the best solution, presented to the customer take their feedback and find out what really is acceptable to them? And, based on this identify the solution that would be used for this project. And, if everything goes fine it is acceptable to the officials and technically feasible, cost wise feasible, time wise feasible, then the project manager will take a go decision. And, the high level solution that he has defined that will be used by the developers and the development will proceed in this style.

But, then the project manager may take a no go decision. May be that the cost that the customer can willing to pay, will not really be beneficial to the company to put so, much of effort and develop it. May be technical competence is not there with the company or maybe schedule wise, the timeline by which the company needs it would be difficult to meet and then the project manager may take a no go decision and would abandon the project.

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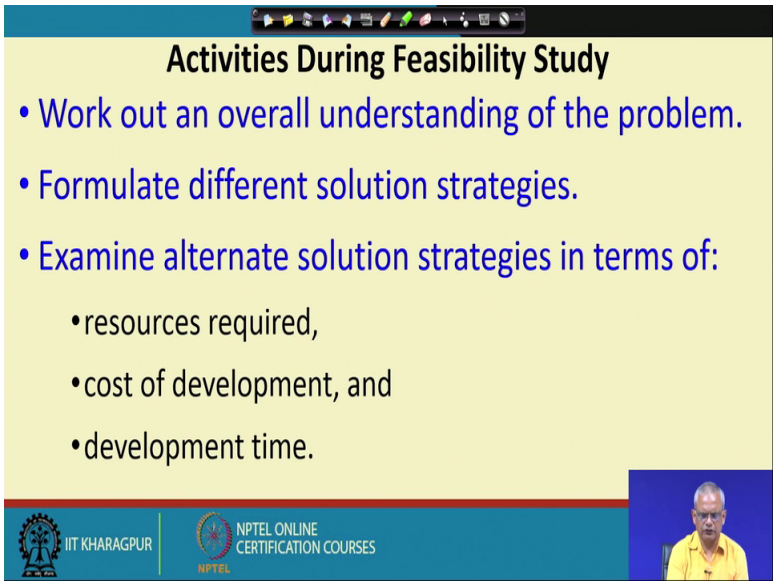

The activities during the feasibility study, we can summarize that work out an overall understanding of the problem. Formulate the different solution strategies, propose alternate solutions and then determine the cost in terms of the resource required cost of development and the development time.

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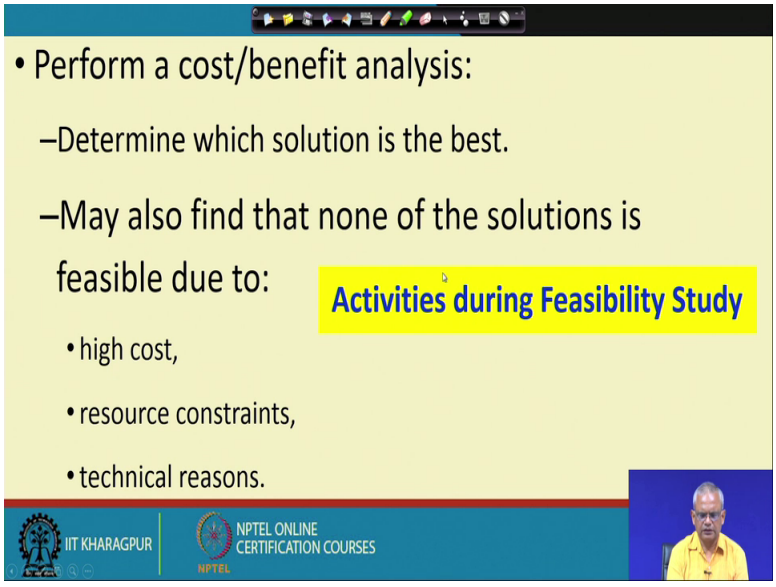

Form a cost benefit analysis find out which solution is the best. And, then may decide to go ahead with the project or abandon the project due to high cost resource constraints or technical reasons.

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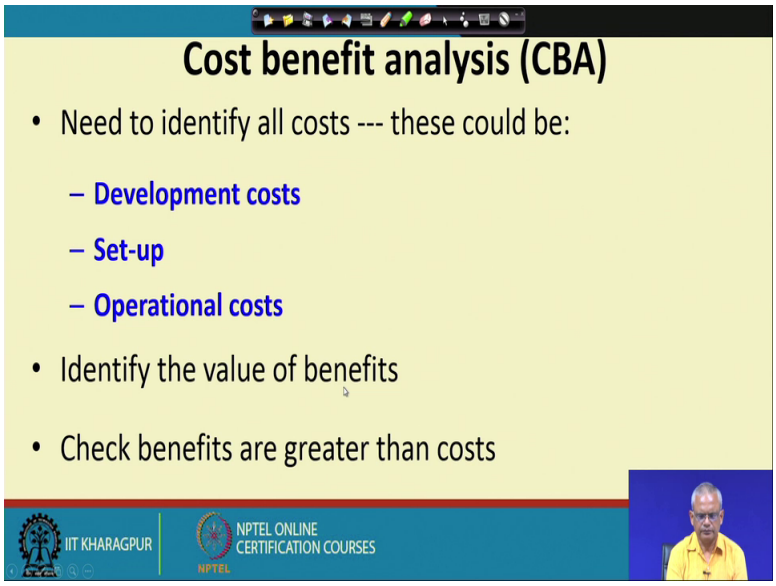

One thing we must remember that the cost of a project is not only the development cost, but also the operational cost like let us say, we want to an educational institute wants to let us say have a automated solution. It is not just developing the software, but also setting up the required infrastructure. And, also the operational cost like who will enter the data, we will take the backup maintenance and so on.

So, an organization trying to deploy an, it solution would identify all these costs. And the cost of the solution would be the sum of the development cost setup and operational cost. And, then would have to identify the benefits of that will accrue from this automation and then check whether the benefits are greater than the cost.

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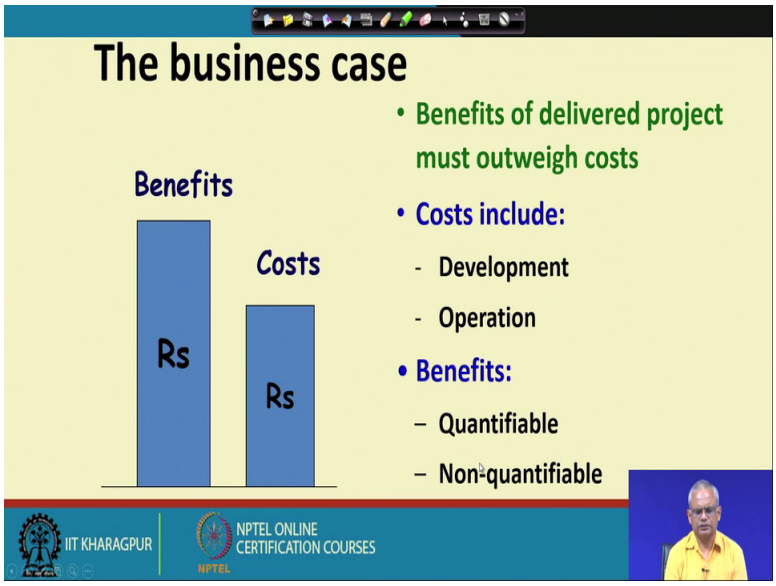

For a project to be taken up by an organization, the benefits must outweigh the costs, the costs are the development operation setup costs, the benefits some of them are quantifiable, some of them may be non-quantifiable. For example, let us say we want to automate the activities bookkeeping activities in an educational institute college.

Some of the benefits are quantifiable that how much manpower is saved by automating it, but some are non quantifiable for example, the results may come out faster the students may benefit. But then, we cannot really put a cost on through this it is difficult to quantify this.

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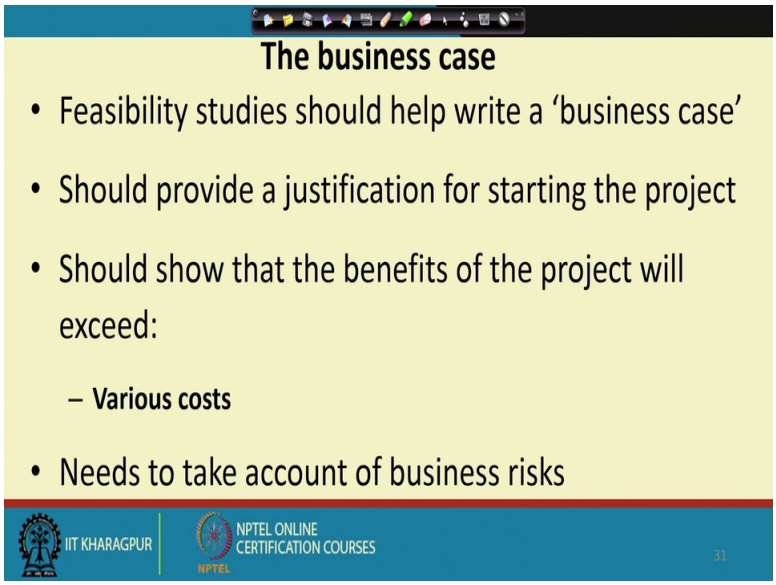

Once, the feasibility study is over typically the project manager prepares a 'business case'. The business case basically mentions that what are the cost and what are the benefit? That is the main points in a business case and then it presents to the top management, that what are the costs that in cost implications and what benefits arise maybe you will have occasions to develop a business case.

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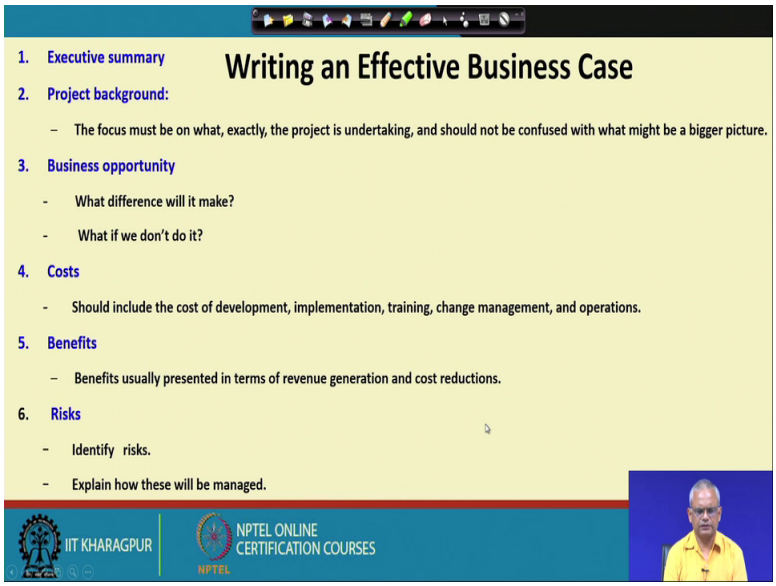

And, typically a good business case should touch upon the following points one is the executive summary, that what exactly is being done is to taken up to be done, for the top

management to understand. The project background that what circumstances why exactly the need for the project arrows, and then the business opportunity that what exactly will be the benefit? What difference it will make? What if we do not do? Then, the costs how much cost for development, implementation, set of training and operation.

And, the benefits how much are the quantifiable benefits in terms of revenue generation cost reduction non quantifiable benefits and then what are the risks? May be the risks can be that the development costs will be much higher than what is estimated. Maybe, it will take more time than what is estimated. May be that once it is developed, it may not be liked by the stakeholders they may not use it and so on, but then there must be some arguments or plan regarding how these different threats or risks will be contained or handled.

These are the different sections for the effective business case and it will be a good idea, if you can develop some business case for practice. For example, assume that you are the it manager of an organization and the organization plans to develop a payroll software. Earlier the payroll was done manually and now wants to develop a payroll software and you want to develop a business case for this after the feasibility study.

Or maybe that you are the it official in a college and the college authorities want to automate the academic, salary, and the purchase activities. And, you are required to do a feasibility study and present a business case.

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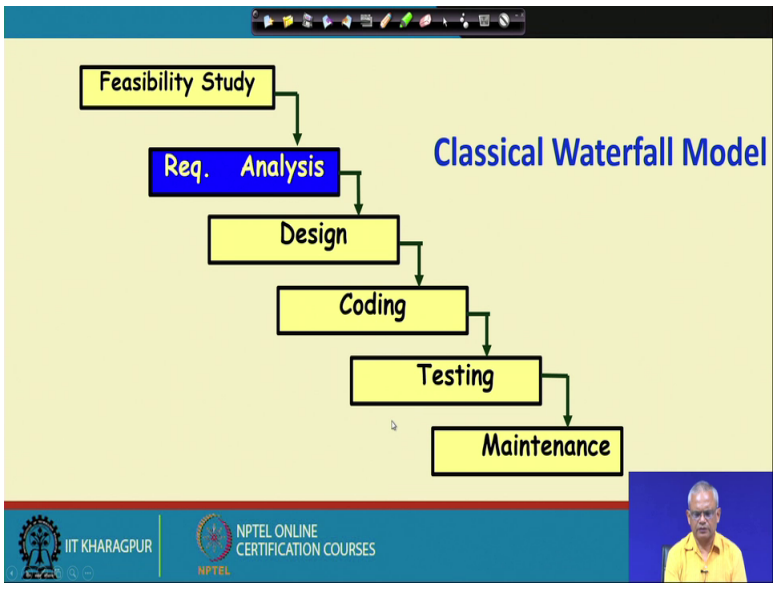

We have so, far looked at the feasibility study phase, we look at the requirement analysis and then design, coding, testing and maintenance. But, look at here that it looks like a cascade of waterfall, the water is falling from one level to the next level and that is the reason why the name comes the waterfall model.

The, first stage is the feasibility study and the second stage is the requirements analysis and specification. We will start discussing very briefly that what are the activities done in requirement analysis? But, right now we are close to the ending time of this lecture we will stop here we will continue in the next lecture.

Thank you.