Software Project Management
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Lecture - 05
Life Cycle Models - I

Welcome to this lecture. In the last lecture we discussed about the software development lifecycle. In the software development life cycle the project starting from the concept is developed by various activities. The software development lifecycle essentially defines all the activities that are carried out and also the ordering among those activities. There is a intuitive concept of the activities that are carried out during the software development, but then as we will see that various project management life cycles structure these activities in different ways. Let us look at some popular Life Cycle Models.

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In this lecture we will discuss about the waterfall model, V model, evolutionary model and the prototyping model.

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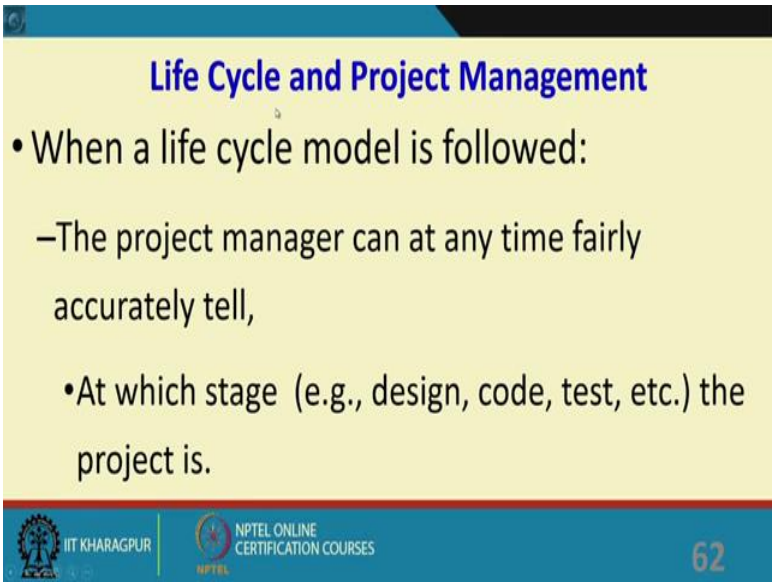

The lifecycle the project lifecycle is very important for the project manager because based on the lifecycle the project manager can track the progress of the project. Because, there are various milestones in the lifecycle and as the milestones are met the project manager can tell how much progress has been achieved or at which stage the project is.

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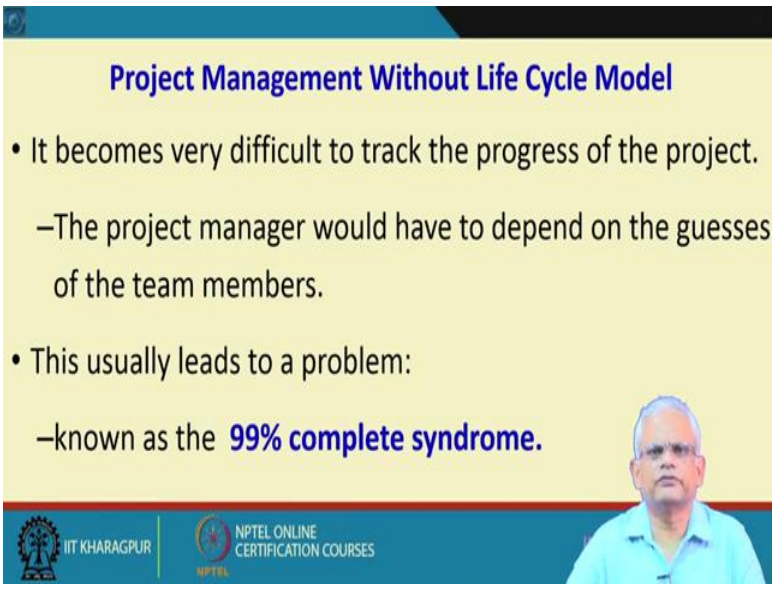

Without a lifecycle model the project manager is handicapped. It becomes very difficult for the project manager to monitor and control the project does not know that how much work is remaining and therefore, the project gets delayed. The cost rises and therefore,

for every non-trivial project the project manager uses a suitable lifecycle model and the development team follows it. Without a lifecycle model usually a problem it is known as the 99 percent complete syndrome occurs. Here the project manager has no way of finding out the progress of the project other than asking the team members that how are you doing, how much you have completed.

Typically the development team is very enthusiastic and they optimistically answer that we have almost done only small thing is there and each time you ask them they say that see we are nearly done. So, the project manager thinks that the project is about to complete, but is far from true. It takes many more months or years even when he the project manager hears the term that the work is almost done and that is known as the 99 percent complete syndrome. It occurs when the project manager has no other way to track the progress of the project other than asking for the opinion of the team members that how far they have progressed.

As we were discussing the project management lifecycle allows the project manager to have various milestones and stage completion by which the project manager can track the progress of the project more meaningfully.

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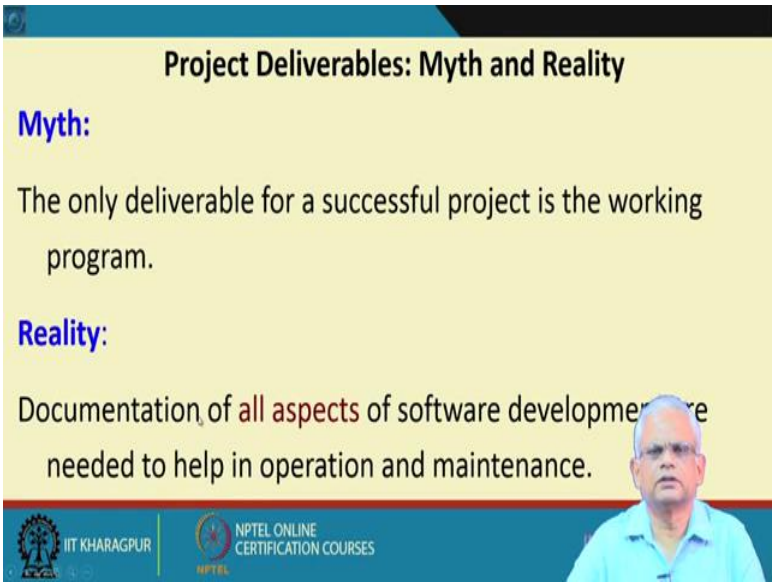

Another very basic concept that we will discuss before looking at the lifecycle models as the project progresses various deliverables are produced. It is a myth if we say that the working program is the deliverable of a project not really. There are a large number of

deliverables that are produced as the project progresses and these are the documentation of all aspects of development for example, specification design etcetera.

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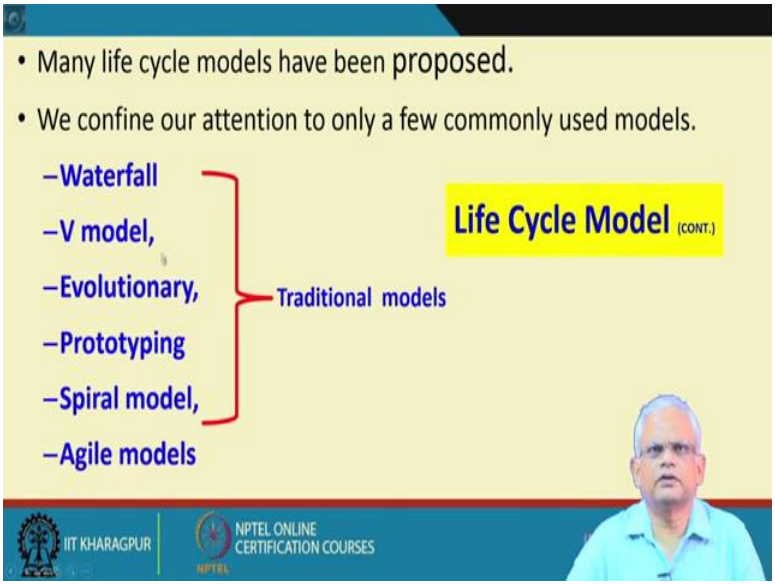

We will discuss about the waterfall, V model, evolutionary, prototyping, a spiral model. This we will call as the traditional model. This have been used for traditional projects where the project is a product development project starting from scratch, but for services type of projects typically the agile models are used.

We will first discuss about the traditional models the waterfall, V model, evolutionary, prototyping, spiral model. We will find out what are the shortcomings of these models. Why they are not so suitable for the services type of projects and we will discuss about the agile model and we will see that how they overcome those problems.

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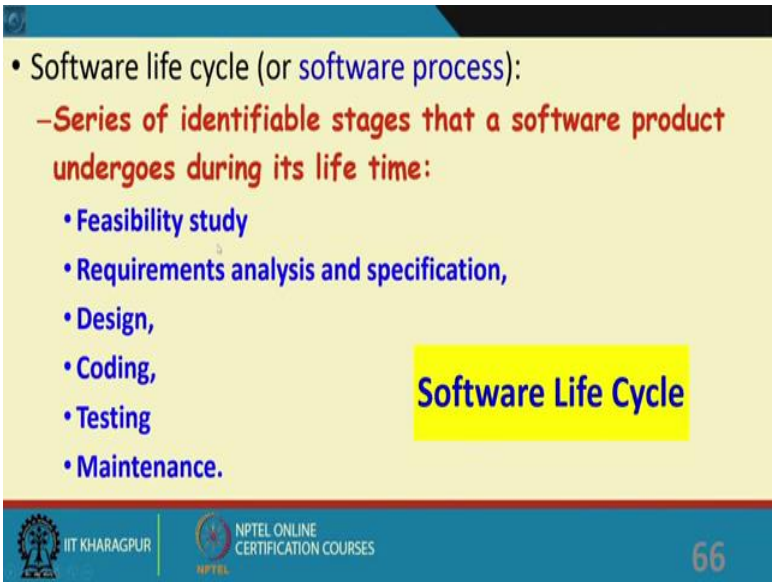

The software life cycle as we had already said, is a series of stages during the development of the software. Intuitively, every software has a feasibility study during which it is decided whether to take up this project or not the requirement analysis and specification, design, coding, testing and maintenance.

So, these are the stages that intuitively every software undergoes the feasibility study requirements analysis and specification, design, coding, testing and maintenance.

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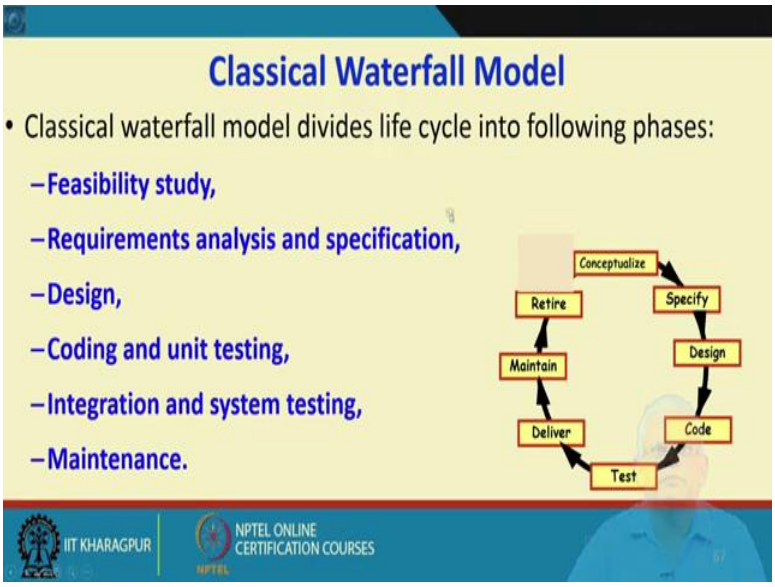

The classical waterfall model fits very accurately to the intuitive model of software development. Here the activities are carried out one after other. First the feasibility study is undertaken then requirements analysis and specification work is undertaken. And once that is complete the design is taken then the coding and unit testing is undertaken, next the integration and system testing is undertaken and finally, the maintenance phase is undertaken.

This is a very close fit to the intuitive model of software development and this is called as the classical waterfall model because based on this model all other lifecycle models have been developed. This is the classical model and all other models are derivatives of this model. So, this is according to the conceptual model of software development we were discussing.

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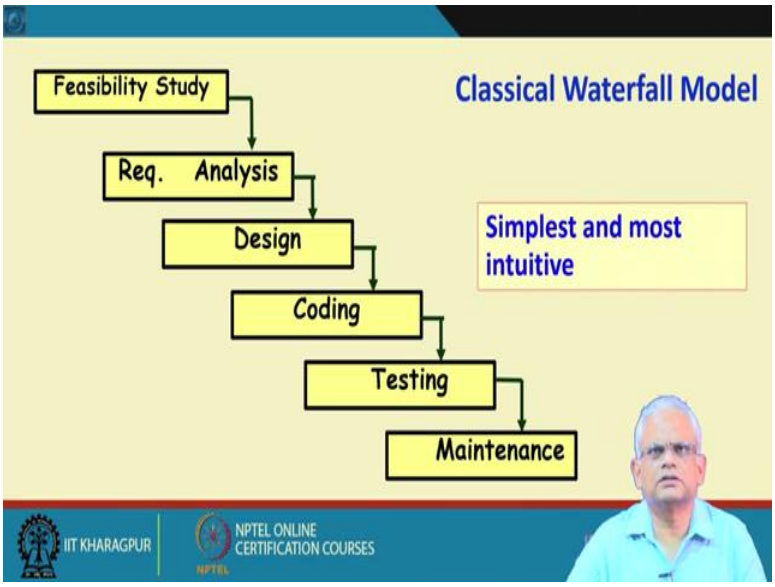

If we represent the classical waterfall model in a diagrammatic form we can see that the different phases are represented here feasibility study, requirement analysis specification, design, coding, testing, and maintenance and there is a transition from one phase to the other. If we look at it looks like a waterfall a series of waterfall and from this the name waterfall model comes. This is the simplest and most intuitive model.

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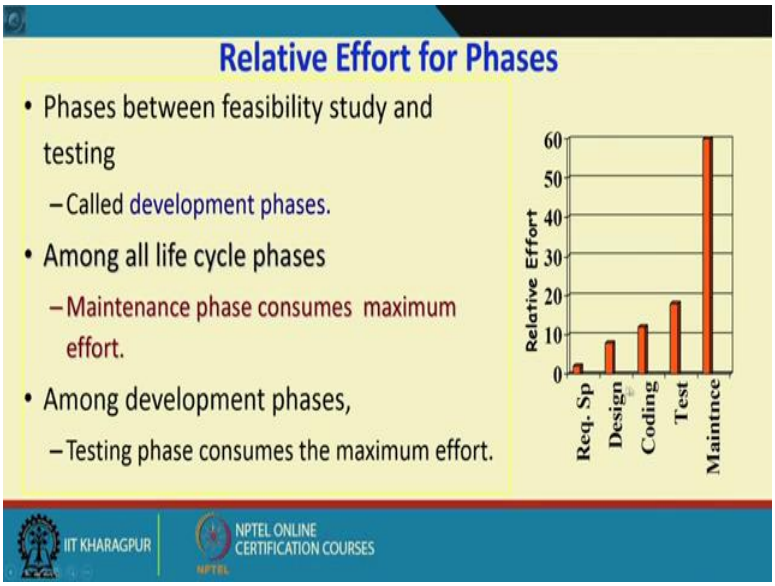

Out of all the phases in the classical waterfall model which phase takes the most effort. If we look at all the phases, the phases between the feasibility study and testing are called as the development phases and then we have the maintenance phase is called development phases because here the product is developed and delivered to the customer and after that the maintenance phase starts.

Among all the phases if we consider all the phases the development phases and maintenance phase then the maintenance phase consumes the maximum effort. But, among the development phases the testing phase consumes the maximum effort, you may wonder that is it really the testing phase which consumes the maximum effort, the answer is that see we are discussing about a commercial software it is not a student project a student project or a student assignment.

The student just checks that it is working for few inputs and then submits it whereas, we are discussing about a commercial software where it has to be extensively tested the quality needs to be maintained because the organizations name is at stake. You can not just give a software having bug to the customers and therefore, the testing phase consumes the maximum effort for every non-trivial commercial software.

If we represent the effort the form of a diagram the maintenance phase takes the maximum effort, but then among all other phases the development phases the testing is

the one which takes most effort and then comes the coding, design and the requirement specification.

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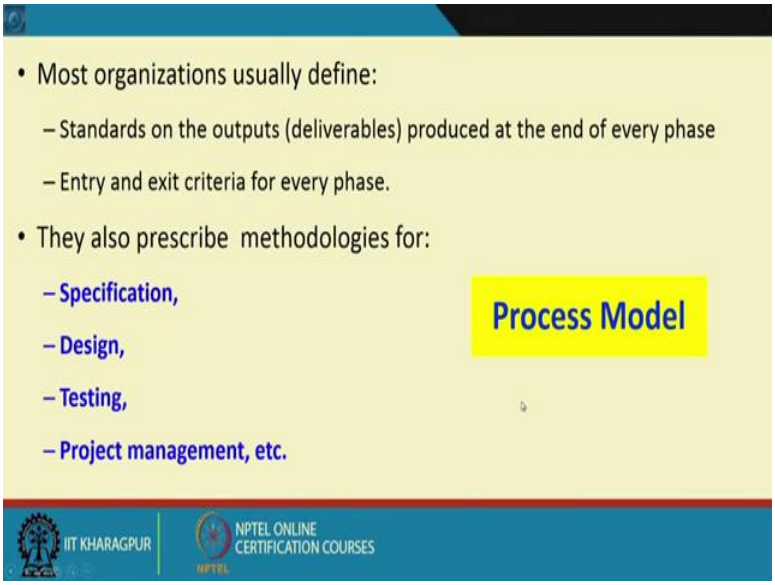

Most organizations they document the software lifecycle model they follow. They are not only they identify all the phases and the activities that take place in the phases. They also identify what are the outputs or the deliverables that are produced at the end of a phase what are the entry and exit criteria for the phase and what are the methodologies that are to be used for by the developers for various phases and this forms a process model document and is a important reference book for all the team members.

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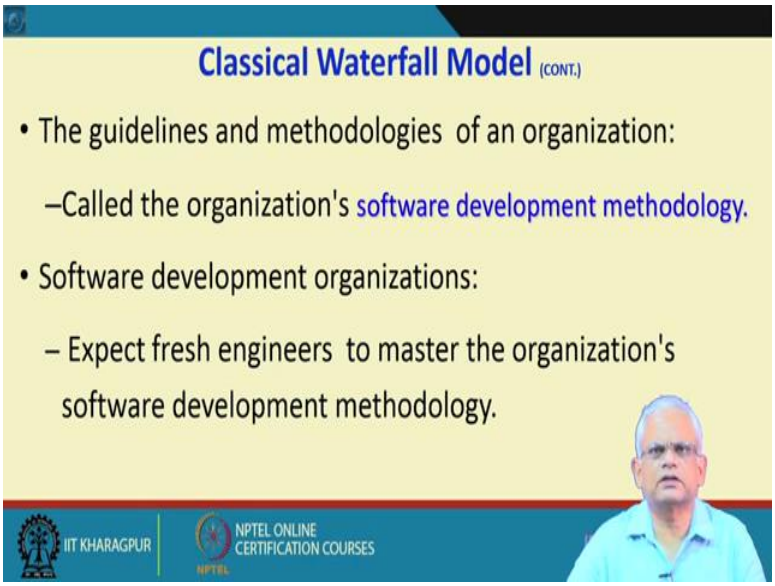

The classical waterfall model we were saying that it is a very intuitive model and other models are derivatives of this model and the development methodology that the organization uses during various phases. These are all documented in the form of a process model book given to the developers and they must understand this well before they undertake the development activities.

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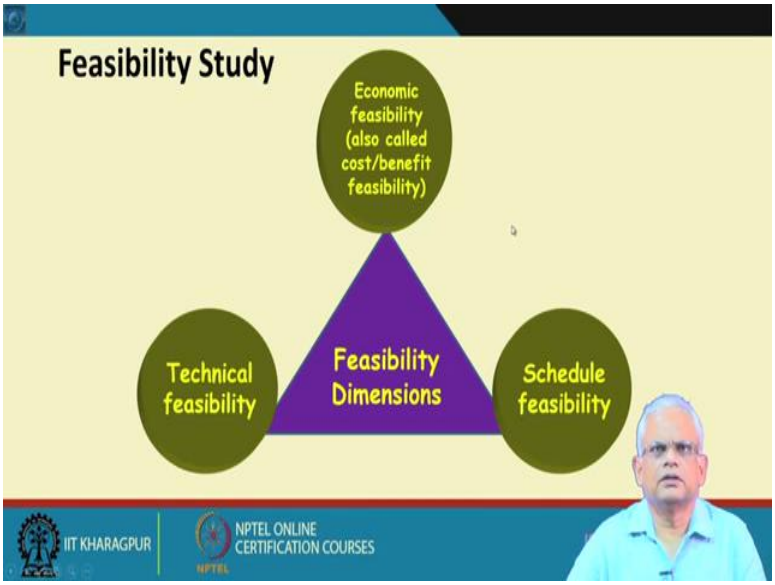

The first activity in the waterfall model is the feasibility study. Here the project manager is responsible to carry out the feasibility study. The project manager needs to identify

whether the project is feasible. So that, it can be undertaken by the development team and there are 3 types of feasibility that the project manager is concerned. There are 3 dimensions of feasibility or 3 types of feasibility that the project manager is concerned.

The first one is technical feasibility whether the development team has the competence and capability to undertake the project. For this the project manager needs to understand various aspects of the development to be undertaken and then assesses whether the team that he has whether they can technically complete this project. Another important dimension of the feasibility is the economic feasibility. Whether the budget that is that would be available would be profitable to carry out the project. This is also called as the cost benefit feasibility.

The third dimension is the schedule feasibility that is the time that the project manager estimates for the project to complete whether the customer agrees to that time or the customer wants the project to be completed in 2 weeks and the project manager estimates that needs at least 3 months and then the project manager would say that this is not feasible schedule wise. Only when all the 3 feasibilities are satisfied the project manager agrees to undertake the project.

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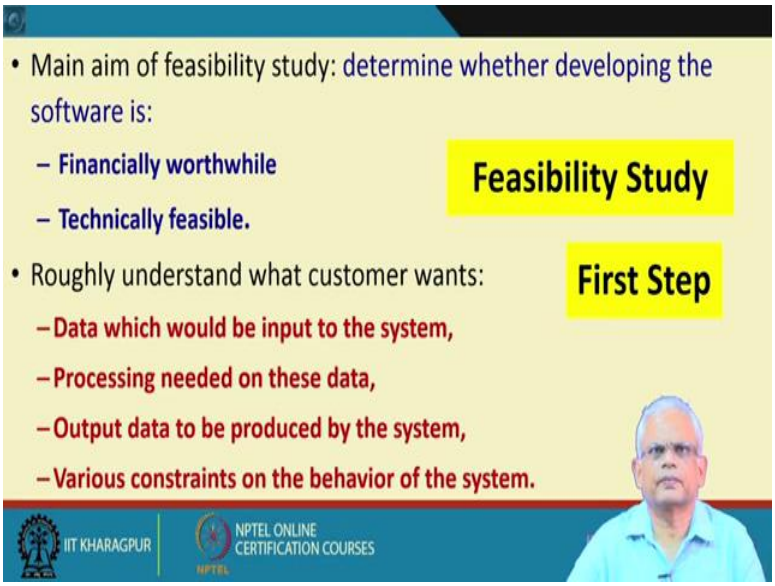

In the economic feasibility the financial implications are considered whether it is remunerative to carry out the work, whether it is technically feasible, schedule wise it is feasible and for this the project manager roughly understands what the customer wants to

do, what the customer wants out of the software, the data which would be input to the system, the processing that needs on the data and the output that are to be generated. And, based on that the project manager identifies that how many developers need to work for what duration.

And, based on that the project manager identifies the cost of developing the project and based on that the budget that the sponsor of the project or the customer provides the budget. Based on that the project manager finds out whether it will be financially worthwhile and based on the activities required as part of the project the project manager identifies whether it is technically feasible and the project manager roughly identifies the time it takes and based on that whether it would be feasible schedule wise.

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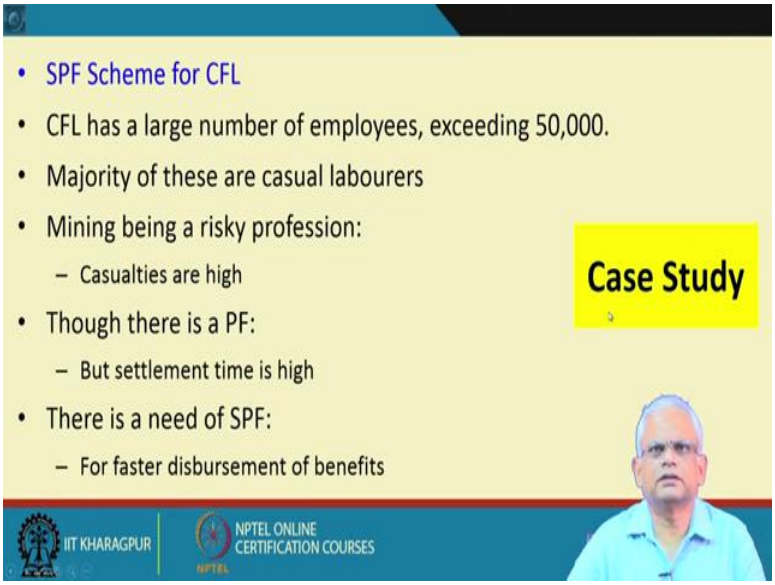

Just a case study to identify just to illustrate what the project manager needs to do to carry out the feasibility study because this is a important activity for the project manager to carry out the feasibility study for a project.

This is a Special Provident Fund Scheme for a Coalfield Limited. Coalfield Limited is a coal mining company and mining being a risky profession. In addition to the ordinary provident fund that are available to the miners the company proposes to have a Special Provident Fund Scheme and for this it has invited bids and the project managers they visit the company and understand what the company needs. They find that the coalfield limited has number of employees exceeding 50,000 majority of these employees are

casual labourers and mining being a risky profession casualties are very high. Though there is a Provident Fund Scheme, but the settlement time is very high and there is a need for a Special Provident Fund Scheme where the fund can be disbursed immediately.

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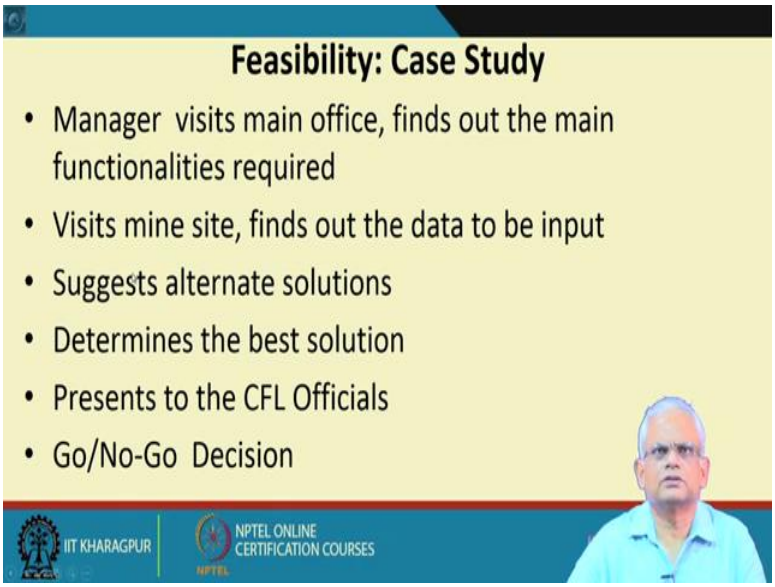

And here the manager first visits the main office of the company, finds out what are the functionalities required from this software, finds that there are various mine sites where the data will be input about the miners who are working for a specific day and the contribution they make for that day towards the Special Provident Fund Scheme.

So, the project manager visits some mine sites, finds out what data to be input, how many data what format and so on and then suggests alternate solutions. For example, there may be local databases at the mine sites and this will be periodically uploaded to the central database at the company's head office and based on that the settlement when there are claims for the Special Provident Fund Scheme these would be made, but then in this the project manager finds that there will be a delay because instantly claims cannot be settled.

But, another solution may be that the local mine sites only upload the data and these are immediately updated on the mine side. There are no local databases at the mines, but these are just data entry stations where the data is immediately updated on the server at the main office of the company, but then the problem here is that an extremely reliable communication link is required because it needs to instantly update the data and the main

computer whereas, the other option when there is a local database the communication link may not be so reliable because only once in a while the data at the main office is updated and the cost for these different solutions is worked out by the project manager and then discusses the Coalfield officials which option would be suitable for them and what is the budget, what is the cost for each one and the budget available, based on that the project manager makes a go, no go decision.

So, this is the typical sequence of activities that occurs that the project manager understands what are the requirements main requirements for the software, what are the alternate solutions that can be proposed to solve the functionalities that are required and what is the cost for each of these alternate functionalities, what is the best solution among these alternate solutions and based on that whether it is financially feasible, technically feasible and schedule wise feasible is determined by the project manager.

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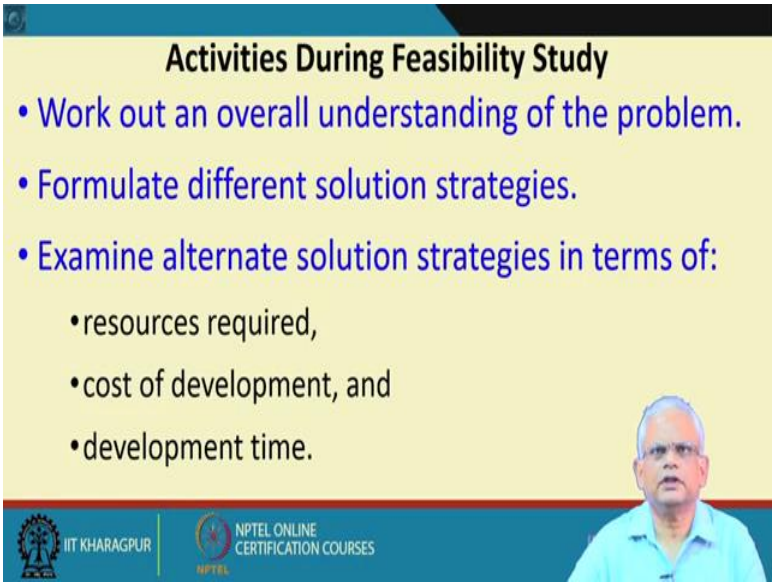

That is what we have just written down here that the project manager first develops an overall understanding of the problem, formulates the different solution strategies and examines the alternate solutions in terms of the resource required, the cost of development and development time.

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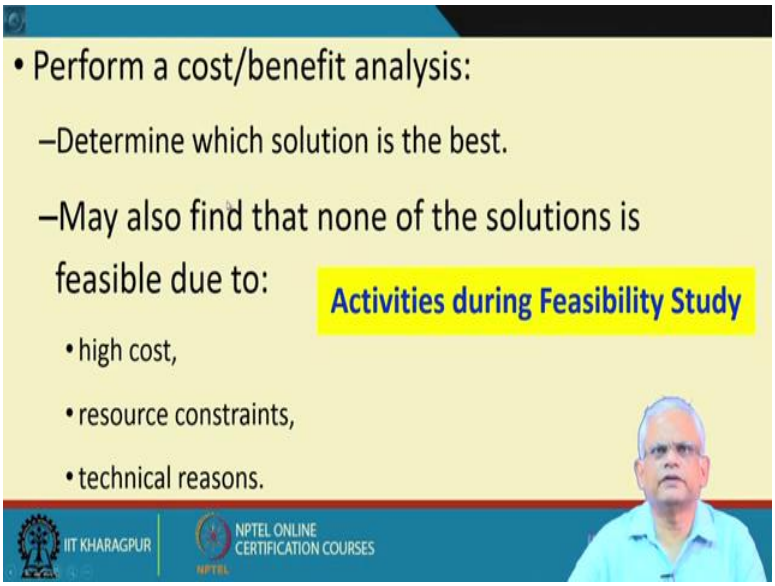

And forms a cost benefit analysis and based on this the project manager finds that it is feasible to carry out the project or find that it is infeasible due to high cost, resource constraints, technical reasons or schedule reason.

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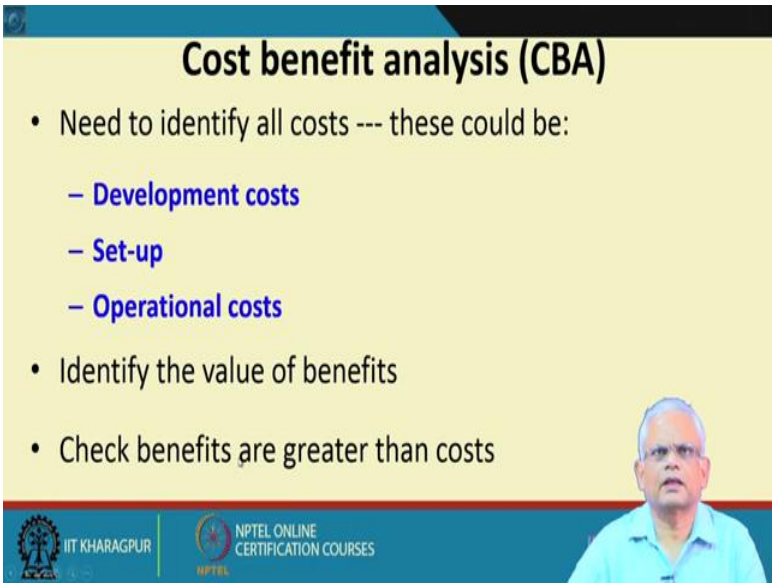

The cost benefit analysis is a important activity during the feasibility study here the project manager needs to identify all costs. The cost can be development costs, the setup cost, operational cost and also identify all the benefits that would accrue. For example, the benefit may not only be the financial budget that it provides the company gets, but

also the experience it builds up the reusable software that it makes and so on. At the end of the cost benefit analysis the project manager needs to check whether the benefits are greater than the costs for the project to proceed.

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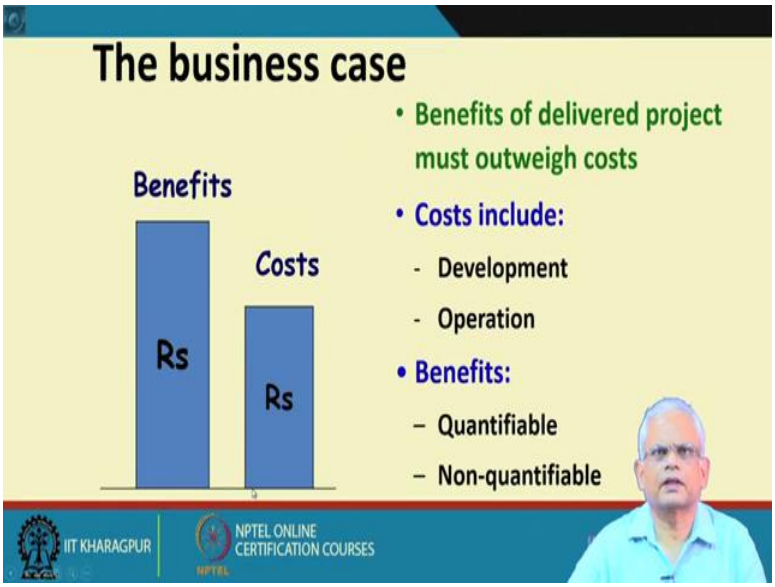

So, this is what I have just pictorially written here that the benefits are more than the costs then the project is undertaken. The costs include development, operation setup etcetera and the benefits some are quantifiable benefits like how much the customer is willing to pay, but then there are non-quantifiable benefits such as the experience reusable software and so on.

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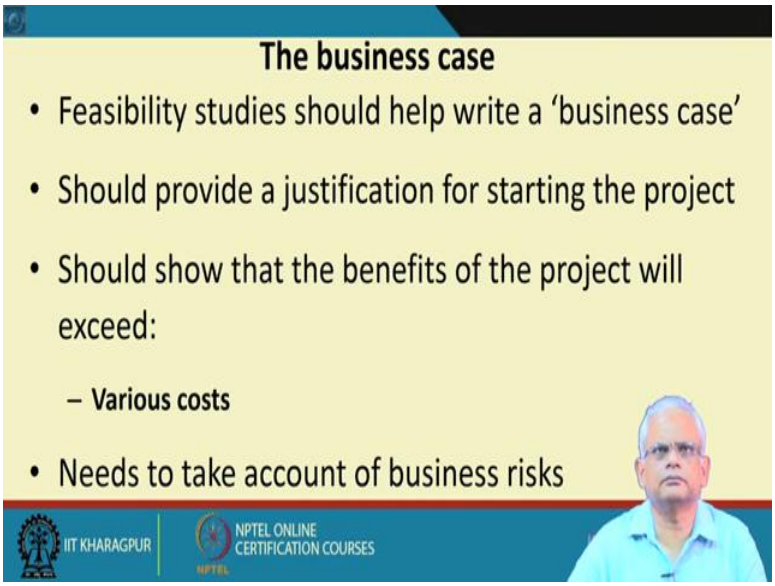

One of the important activity of the project manager is write to write the business case. We had said that this is one of the initiating processes to write the business case. The feasibility study once it is undertaken helps the manager to write the business case. Here the project manager provides a justification for starting the project and shows that the benefit of the project exceeds the cost and also identifies the business risks.

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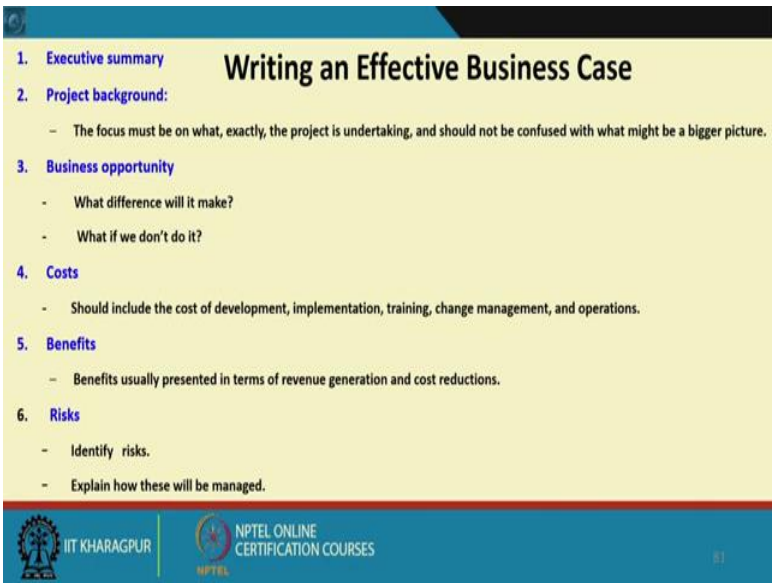

The business case is a very important document and writing a business case is a important project management process initiating process almost anybody aspiring to

become a project manager needs to write a business case sometime or other. Here for writing a business case need to have an executive summary of what is required, the project background, the business opportunities that is what are the benefits that the project will bring, what we will lose if we do not do the project, what are various costs that will be incurred as the project progresses, the benefits and what are the risks and how these risks will be managed.

The business case is submitted to the top management. This gives them an overview of what is involved in the project. How it will help the company and what are the costs and benefits and what will be the risks here and what are the plans of risk management. This forms an important project initiation process. With this discussion we will just stop here and continue in the next lecture.

Thank you.