Software Project Management
Prof. Rajib Mall
Department of Computer Science and Engineering
Indian Institute of Technology, Kharagpur

**Lecture - 04**
Project Management Standards

Welcome to this lecture, in the last lecture we were discussing about the project management lifecycle and the software development lifecycle. And we had said that the project management activity start much before the software development activity start with that let us discuss further.

(Refer Side Time: 00:48)

In this lecture we will discuss 2 main concepts, the project management standards and the life cycle models.

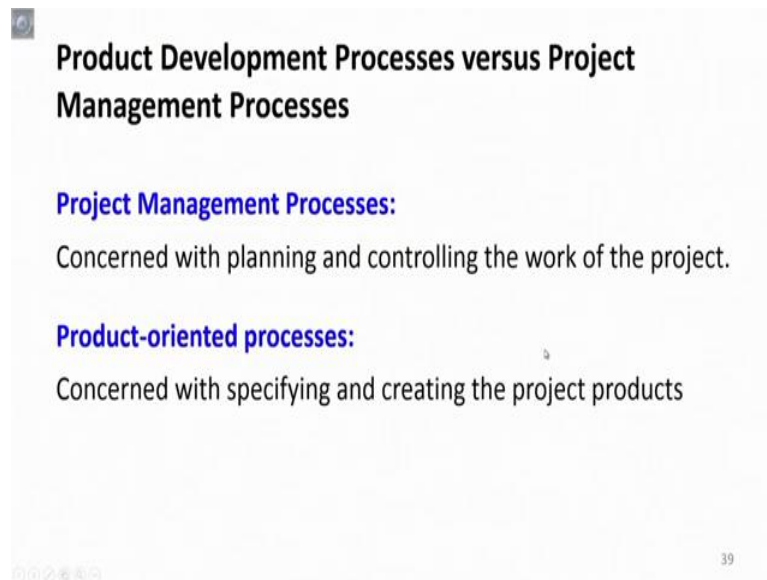(Refer Side Time: 00:54)

Typical Project Life Cycle
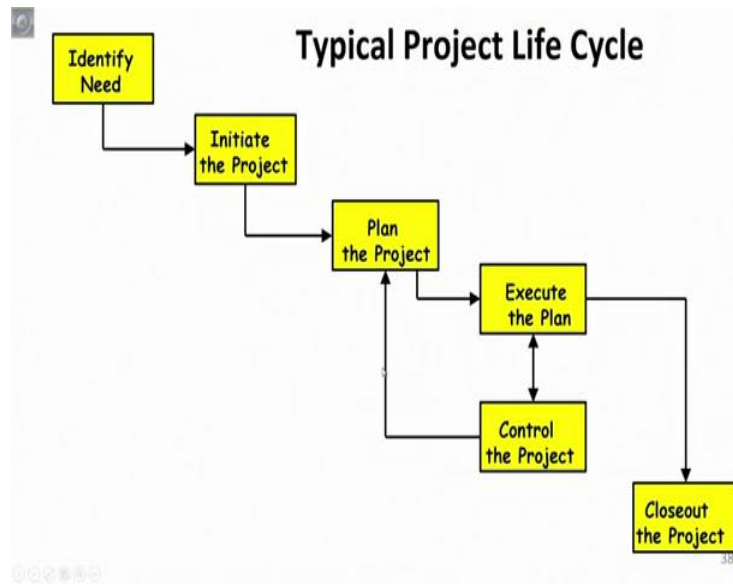
In a typical project life cycle almost every software starts with a need for the software somebody in a organization feels the need for a software to automate certain things and based on that the project proposal is written and it is approved by the top management. The project manager is appointed and that forms the initiation of the project and after the project manager is appointed for the project; the project life cycle starts with planning the project. In the plan of the project various types of plans are prepared the schedule, the configuration management, the risk management and so on.

And once the plans have been prepared, the project development lifecycle starts and that forms executing the plan and during the execution of the plan the project manager executes the plan that is directs the development team to proceed according to the plan. But as the project progresses there can be several deviations from the plan and for this the project manager need to perform some control activities, maybe there is some bottleneck why the project is not progressing as per the plan. The project manager works to remove the bottleneck for example, there may be a shortfall in the technical personnel or there may be shortfall in the hardware equipment, the project manager proactively removes those hurdles, so that the project proceeds as per the plan.

But then, the project manager might have to rework the plan because even in spite of that there will be delays or there may be some part of the project may get completed quickly than anticipated and so on. And once the project completes, the project manager carries out the project closeout activities as we proceed we will look at all these activities in more detail.

Product Development Processes versus Project Management Processes

Project Management Processes:
Concerned with planning and controlling the work of the project.

Product-oriented processes:
Concerned with specifying and creating the project products

During the project lifecycle, the project manager executes the project management processes let me repeat, during the project lifecycle the project manager carries out the project management processes. The project management processes are concerned with planning and controlling the work of the project. The activities here the project manager performs the planning of the project, executing the plan that is directing the team to carry out development work and whenever there is a deviation, the project manager controls removes the bottleneck, so that the project proceeds as per the plan.

In contrast the development team carries out product oriented processes; the product oriented processes are concerned with specifying and creating the project products that is they may do the requirement specification process, design process, coding process, testing process and so on. So, those we call as the product oriented processes, these are carried out by the development team whereas, the project manager carries out the project management processes.

Project Management Processes

- **Initiating processes**
  – Complete of the business case and project charter
- **Planning processes**
  – Complete the WBS and scope statement, project schedule and cost estimate
- **Executing processes**
  – Perform actions necessary to complete the work described in the plan
- **Monitoring and controlling processes**
  – Measure progress toward the project objectives, monitoring deviation from the plan and taking corrective action to match progress with the plan
- **Closing processes**
  – Formal acceptance of the work and creation of closing documents

Let us see what are the project management processes, the project management processes consist of initiating the project, here the project manager writes the business case and the project charter, as we proceed we will see the business case and the project charter.

The project manager also carries out the planning processes that is completes the work breakdown structure and performs the project scheduled cost estimation and so on. And then the project manager carries out the executing processes, which basically performing the necessary action to complete the work as outlined in the plan, but then during the execution process there may be deviations from the plan.

And the project manager needs to carry out the monitoring and control processes where the project manager checks, whether the project is proceeding as per the plan or there are deviations from the plan and when there are deviations the project manager takes corrective actions to match the progress of the project with the plan. And finally, the project manager needs to carry out the closing processes, where the closing documents are created and the customer finally gives the formal acceptance of the project.

(Refer Side Time: 07:51)

Major Project Management Standards
(Conventional Types and Customized)
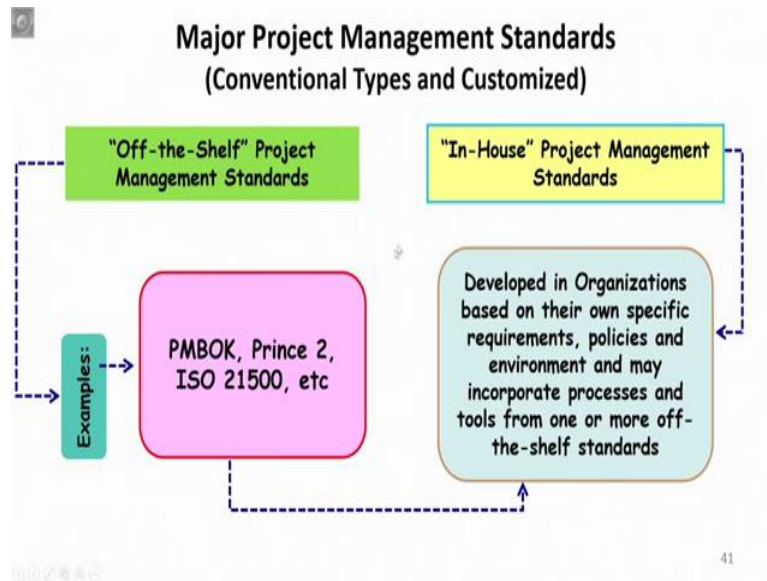
There are several guidelines which have come up for the project manager to carry out the project management processes. There are 2 main types of project management standards, one is off-the-shelf project management standards, these are described in books and so on and here the popular ones are PMBOK that is Project Manager Book of Knowledge Project Management Book of Knowledge and PRINCE2 and ISO 21500 and so on. There are many other we just given some important examples here.

On the other hand an organization may have a slightly different project management standard as compared to the off-the-shelf standard, they might tailor or maybe take different aspects from different standards and they might have a tailored in house project management standard where that specific organization follows the standard.

It may be a good idea to know what is involved in the PMBOK, PRINCE2, ISO 21500 and in our discussion we will not restrict our self to any one standard, but our discussion in this course will be more on concepts that are used across all these standards.

(Refer Side Time: 09:37)

What is PRINCE 2 ?

- PRINCE stands for: Projects IN Controlled Environments
  - A generic project management method--PRINCE1 was specific for IT-project management.
  - developed by the UK's Office of Government Commerce
- Popularly used in UK.
- Process-driven approach.
- PRINCE2 can be used for both small and big projects.

PRINCE2 is a popular project management standard. PRINCE stands for Project IN Controlled Environments. This is not restricted to only software development, but the PRINCE1 was more targeted to the IT or software project management and PRINCE2 is become a more generic project management standard. This was developed by the United Kingdom office of government of commerce, it is very popular in the United Kingdom it is a process driven approach and has been used for both small and large projects.

(Refer Side Time: 10:39)

PRINCE2® – Processes

Seven processes.
- Starting a project
- Initiating a project
- Directing a project
- Managing a stage boundary
- Controlling a stage
- Managing product delivery

There are essentially seven processes in PRINCE2, the projects starting processes, initiating processes, directing or executing processes, managing a stage boundary, controlling a stage and managing product delivery.

(Refer Side Time: 11:03)

PRINCE2 Processes
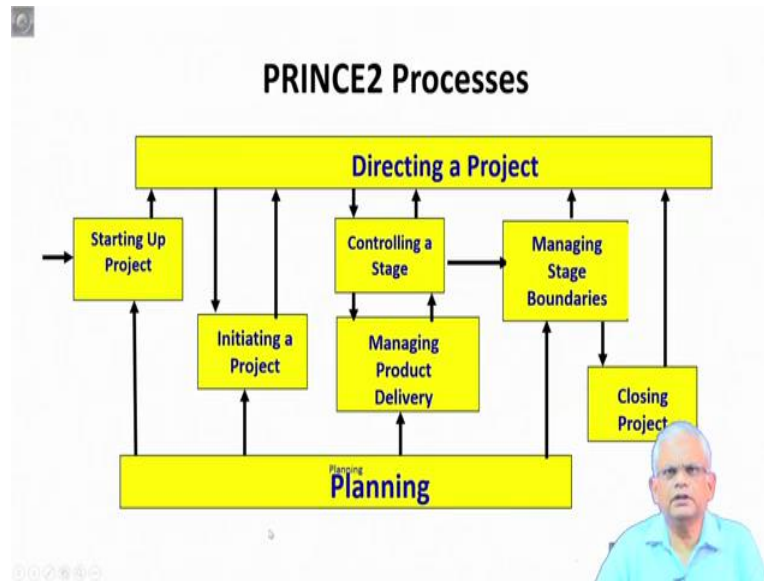
If we represent that pictorially there is a start-up processes and then 2 main processes which exist throughout the project are the directing a project which is basically execution of the project and then planning continues throughout, because once the initial plan is made it is continuously revised and based on the plan once the plan is complete initial plan is complete.

The project is initiated and the project undergoes various stages and in each stage, the project manager directs the project activities and the project team carries out the activities and here the project manager monitors and controls each stage. And at the end of the stage the new stage needs to start, so this is called as the managing the stage boundary and after all the stages are complete one by one stages are taken up here and once all the stages are complete the closing processes are undertaken by the project manager.

(Refer Side Time: 12:35)
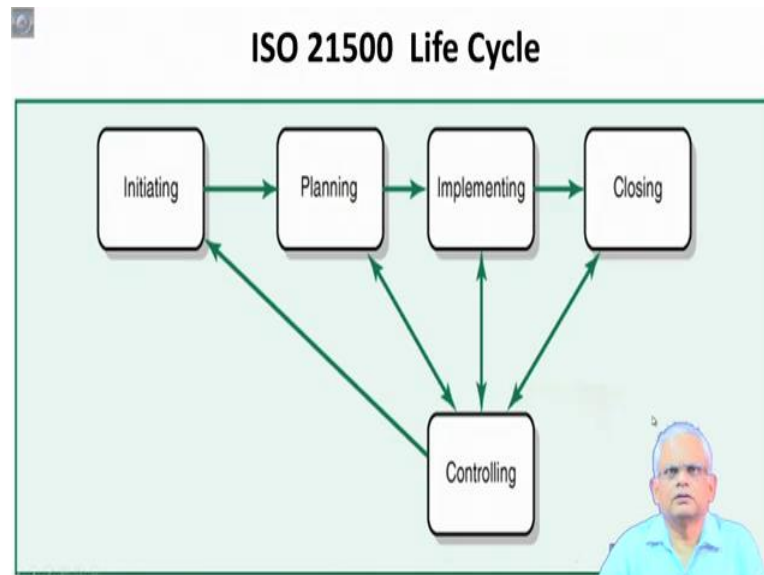
The ISO 21500 life cycle here also we have the initiating processes, the planning processes, implementing or the directing or executing processes and finally, the closing processes and throw out the controlling processes are carried out by the project manager.

(Refer Side Time: 13:03)

PMBOK is a very popular project management standard, it is the Project Management Body of Knowledge, it is a dominant project management standard used widely across various projects. The PMBOK basically consists of several terminologies and guidelines and this has been documented in the form of a book as you can see here Project Management Book of Knowledge PMBOK guide. It is published by the Project

Management Institute PMI and this guide is used as a support to prepare for the certification offered by the PMI.

(Refer Side Time: 14:03)

In the PMBOK there are various process groups each process group consists of several processes. There are the initiating process group, but the project initiation activities are carried out by the project manager and as the project takes off the planning processes are carried out by the project manager. The initial plan is made and the plan is continually refined. The executing processes the project manager directs the project team to carry out various activities and at the same time the controlling processes are carried out. The monitor if there are deviations from the plan and then take controlling actions and once the project completes the closing processes are carried out.

So, these are 5 main process groups in the PMBOK the initiating processes, the planning processes, the controlling processes, executing processes and closing processes. As you can see across all these different project management standards many things are common, the processes, the initiation, planning, executing or directing, monitoring and controlling and finally, the closing processes. As I told earlier will not restrict our self to any one project management standard, but we look at these various processes the project managing management processes across all these different project management standards.

The initiating processes this is the one that is carried out by the project manager first in the project lifecycle. The main goal of these processes is to start off the project. The outputs of these initiating processes are that the project manager is selected, the key stakeholders are identified and the project charter is completed. The project planning processes here the output include work breakdown structure, the project schedule in the form of Gantt chart and identification of all dependencies and resources and a list of prioritized risks.

(Refer Side Time: 17:02)

PRINCE vs PMBOK

PRINCE2	PMBOK
Origin – United Kingdom	Origin – United States
Administered by APMG	Administered by PMI
Worldwide adoption	Worldwide adoption
A process based project management methodology	A knowledge based approach to project management
Prescriptive, but tailorable	Non-prescriptive
Used mostly within UK	Used worldwide and followed by over 75% of projects

If we compare two popular project management standards the PRINCE and the PMBOK, we can see that the PRINCE is the origin is United Kingdom whereas, the PMBOK the origin is United States. Here the PRINCE2 is administered by the APMG which is Association for Project Management Group, PMBOK is administered by the project management institute, both are very popular used worldwide, but PMBOK is used more extensively than PRINCE2.

PRINCE2 is a process based methodology as you had seen whereas, PMBOK is a documentation of the knowledge, it is non prescriptive and the project manager is having flexibility to adopt his own processes, but these just serve as the guidelines. PRINCE2 is used mostly in UK, the PMBOK is used worldwide, over 75 percent of the projects worldwide use PMBOK.

(Refer Side Time: 18:32)

Now let us look at the life cycle models, because the project manager executes the project management executes the project management processes to direct the project team to carry out the development work. At different stages the project team carries of different activities and therefore, as a project manager we must be clear about the various life cycle models, what are the stages through which the development proceeds, the stage boundaries and so on. Here we will emphasize only on the basic concepts.

(Refer Side Time: 19:32)
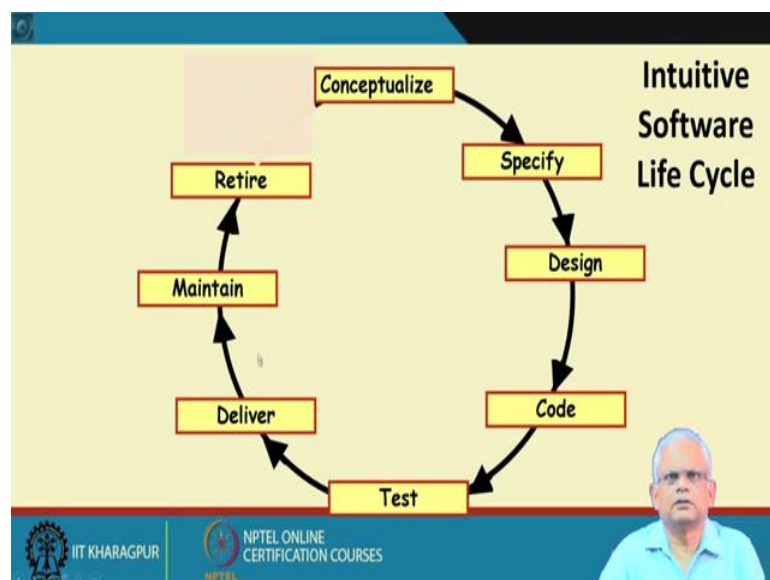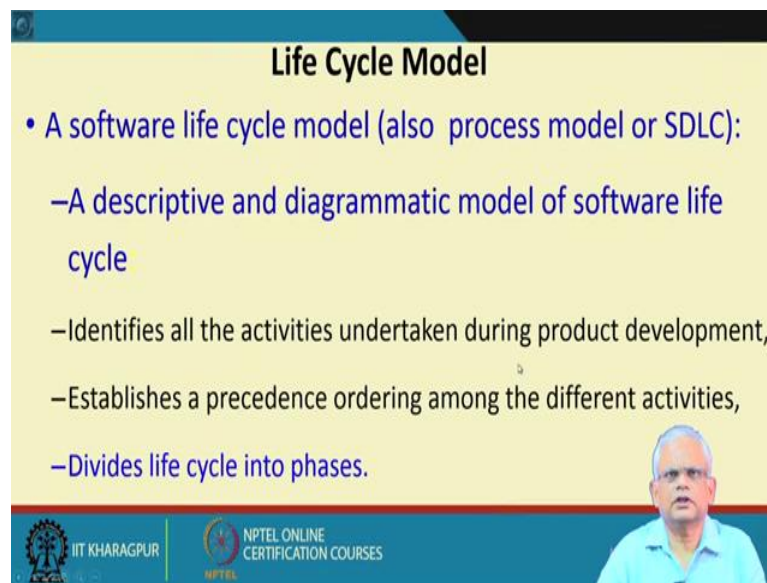
Intuitively a software life cycle consists of first somebody thinks of the project the need for the software and then the project is specified, it is designed, it is coded, it is tested, finally, delivered and once it is delivered and used it needs maintenance and it undergoes

maintenance for number of years as the software gets used over many years maintenance activities proceed and finally, once the software is not used anymore it is retired.

So, this is the intuitive model of software development conceptualize, specify, design, code, test, deliver, maintain and retire. Based on this conceptual model of the software life cycle various life cycle models have been proposed where these activities the sequencing of these activities vary.

(Refer Side Time: 20:49)

The life cycle model is also called as a process model or software development lifecycle model. It is a diagrammatic representation of the software life cycle and it is also accompanied by a description. The software life cycle model essentially identifies all the activities that are undertaken during the product development. It also establishes a precedence ordering among the activities and it divides the life cycle into phases.

(Refer Side Time: 21:29)

And each phase consists of several sub activities for example, the design phase may consists of the sub activities structured design, structured analysis, structured design, design review and so on.
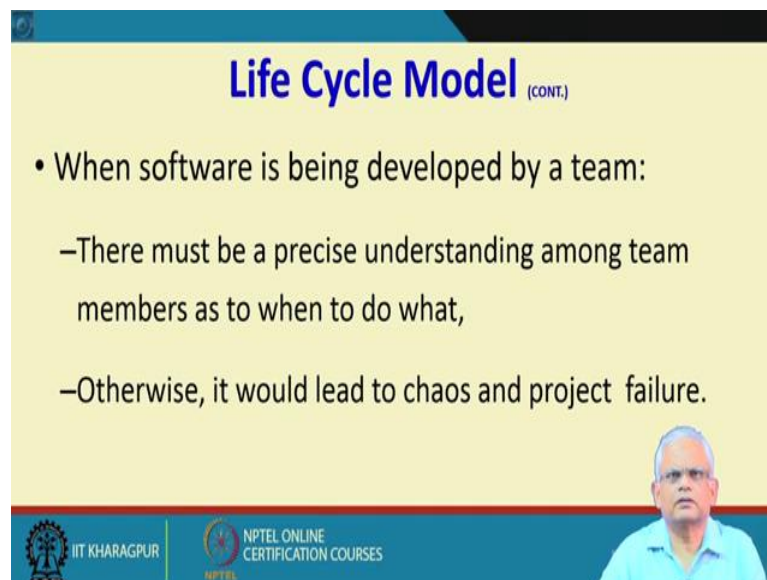
(Refer Side Time: 21:47)

For very small projects let us say student assignment, the student unconsciously follows a build and fix model it is not a formal life cycle model, but this intuitively comes to the student. This yields success for very small projects like a student assignment where the problem is within the grasp of an individual, the build and fix model works. As the name says here do the initial building here write the code here for the project and then test, as long as the code does not pass the test carry out fixes, again test carry out fixes; again

test until the developed code passes all the tests. This is also called the exploratory model, here the problem is very small and the developer has flexibility and freedom to undertake whatever activities he feels like.

So, there is lot of flexibilities built into the build and fix model. For example, the developer may first code, then test, do a little bit of design, then test, fix and so on or my code, then do some design, test, change code and so on or may specify, then code, design, test, etcetera. So, this model build and fix model is a very very informal model suitable only for projects where which is rather trivial like a student assignment.

(Refer Side Time: 23:59)

But when the development is to be carried out by a team the formal process model has to be followed, there must be a precise understanding among the team members that what are the activities, which activity needs to be done after what, who will do and so on, otherwise it will lead to chaos and project failure.

(Refer Side Time: 24:22)

If the build and fixed model is used for developing a non trivial project and the team starts using the build and fix model, then maybe one of the developers will start writing the code, another will try to design, the third one will write to the do the test document and so on. Another may define the IO for his portion first and so on and this way the project will not succeed. There will be too much of delay poor quality of code will come out, there will be a lot of idling, cost escalation and a very poor quality code will come out. So, an informal project model like a build and fix model is not suitable for non trivial project work.
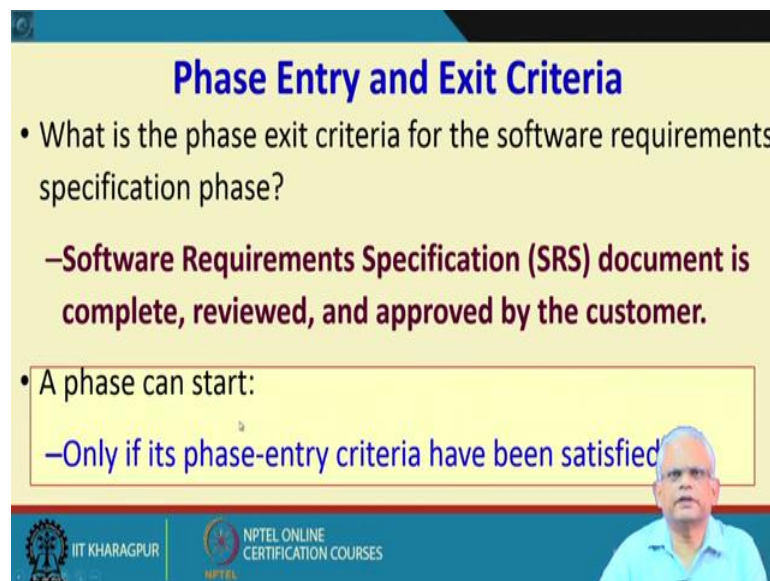
(Refer Side Time: 25:19)

Before we look at the different project lifecycle models you must know what is the phase entry and exit criteria. A life cycle model as we said that consists of various phases and each phase starts when there are some criteria are met we call that as the phase entry criteria, only when those criteria are satisfied the phase starts and when some criteria are satisfied the phase ends. So, for every phase it is necessary to define the entry and exit criteria for that phase.

(Refer Side Time: 26:08)

For example let us say what is the phase exit criteria for the software requirement specification phase? The exit criteria is that, the requirement specification document must have been completed, it must have been reviewed and approved by the customer. Similarly a phase can start only when it is phase entry criteria have been satisfied.

(Refer Side Time: 26:43)

Another important concept is the milestones, a milestone is very important for the project manager because using the milestones, the project manager keeps track of the progress of the project. There are various types of milestones, but one important category of milestones are the phase entry and exit, when there is a phase starts after the phase entry criteria has been met an important milestone is met.

Similarly when the phase completes and the exit criteria are satisfied, the project definitely has made some progress and that forms another important milestone, with this discussion we will conclude this lecture and in the next lecture well discuss a few project lifecycle models.

Thank you.