Software Engineering
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Lecture - 39
Other PM Processes

This session has a large agenda. If you look at the slide, today we are going to talk about project cost management process, human resources management process, project communication management process, project procurement management process and project integration management process.

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In addition we are going to talk about the role of project manager in project management. Let us start with project cost management processes. The project cost management process is primarily concerned with the cost of resources needed to complete the project. We are worried about the life cycle costing together with the value engineering or whatever techniques that we can use to reduce the cost and of course as you know we always try to compromise between cost, time and quality. Improving the quality and performance and at the same time reducing the cost is a big challenge. So, taking this kind of decision the optimal decisions involves four subprocesses.

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If you look at the slide again the first is resources planning process, the cost estimation process, the cost budgeting process and the cost control process. In our particular contest the resources planning process is aimed at determining physical resources like people, material, and equipment will be required and in what quantities they will be required, when and where they will be required to perform the project. Obviously the resources planning need to be very closely tied down with cost estimation.

Important questions need to be answered during the planning as to what this organization seem to be doing similar tasks that the organization have the necessarily resources or we need to procure them from outside, would it make sense to outsource the thing rather than hiring somebody or consulting somebody or something like that. So with the organizational policies and the available resources we need to strike a balance.

The resource estimation basically is affected by the nature of the project and the organization. Estimation should be done ideally by the people who are experienced in it and who have the expertise, people who are familiar with doing the job and consumers of resources should be involved in making the estimates. Various alternatives related to resources should be thoroughly considered at this particular time.

Once we have identified the resources then we need to estimate the cost associated with these particular resources. o, resource planning is followed by cost estimation. The cost estimating involves the estimating the cost as the name suggests. This includes identifying and selecting several alternatives, spending more on design may result in reducing the production cost or some trade offs of this particular type. So when estimating the cost for contracted project it is essential to realize that the costing and pricing is not the same.

Price is a business decision whereas the cost is actual, something that you incur. Therefore costing is linked with results while the pricing is a business procedure. Another thing you must remember is, costing is only one input for making the pricing. When you are doing IT project cost estimation the estimates are prepared usually before the requirements are clearly defined. That is one of the major problems in software cost estimation. Adequate historical data may or may not be available and the management and the stake holders may want lower estimates for winning or getting the contracts. So, from that particular point of view it is very difficult to strike a balance and come out with cost estimates of this particular thing. Once you have made the estimates and when you decide to zero in on the action you need to make a budget.

Now there is a lot of difference between the estimating and the budget. Budget is getting the approval for spending that money. The entire project experience may not be sanctioned at one go and you may have to put forward budgets as the project progresses. So the cost budgeting process involves allocating the overall cost estimate to the individual work items, in parts you will keep on getting that. Usually this will be associated with the work breakdown structure. So the objective of cost budgeting process is to prepare a budgetary estimate and the base lines on the basis of which you will keep on comparing the actuals with the estimates. So with this I will be in a position to do the project. To give you an idea let us look at the slide for budget.

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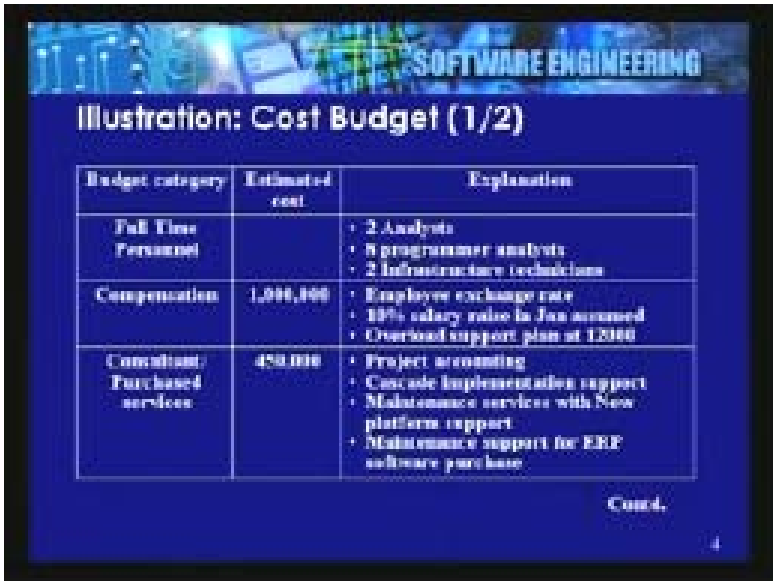

A budget will be of this particular type, for instance how many people are required, what type of people are required, what kind of compensation is going to be involved in hiring or keeping people, will there be anything that you will be spending outside to do on consultants or purchasing of this particular kind of a thing etc. You might go further and say yes some money may be required for travel, you might require money for depreciation, rent, lease and other supplies, expenses and there may be some

contingencies and you will get a total with the adequate explanation being given on each of these items.

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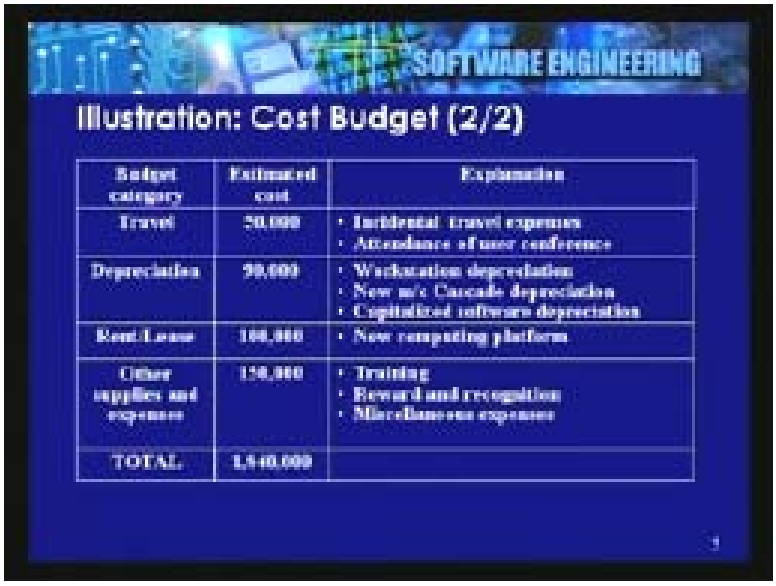

Now once you got the budget approved that becomes a spending way. The authorization for spending has basically come and now what you are required to do is on an ongoing basis control the cost. So the next particular process involves cost control.

Cost control is concerned with influencing the factors that cause the changes to the cost base line to ensure that if there are any changes from the base line these changes are agreed upon determining the cross base line has remained static not changed and in case there are any changes those changes need to be managed. So the cost control basically includes monitoring the deviations from the plan and then taking appropriate action in respect of those particular deviations ensuring that all changes are properly recorded preventing incorrect, inappropriate or unauthorized changes are some of the other things that go with the cost control kind of a thing.

Another important thing is the stake holders need to be kept informed about any changes that might have been authorized with respect to the base line. So in this manner monitoring and cost performance involves understanding both the positive as well as the negative variances of the plan. Once you have proved the costing of that particular part the next thing we are worried about is human resources. Again if you look at the slide we have three subprocesses here; the organization of HR planning, staff acquisition and team development processes.

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Now let us look at some of these things. Human resources management process is aimed at making sure that the human resources are used in a most effective manner. Basically all the stake holders are your resources and make sure that you are utilizing the skills available and whatever else in appropriate manner. In case you have the organization as a whole which is project ties usually doing many particular projects then there is a generic process within the organization and your human resource management needs to fit within this particular kind of activity. So it involves understanding and applying the concepts of motivation, influencing the people, power etc for making sure that the project succeeds. Since the project operates within the organizational environment these concepts need to be applied on a wide variety of people.

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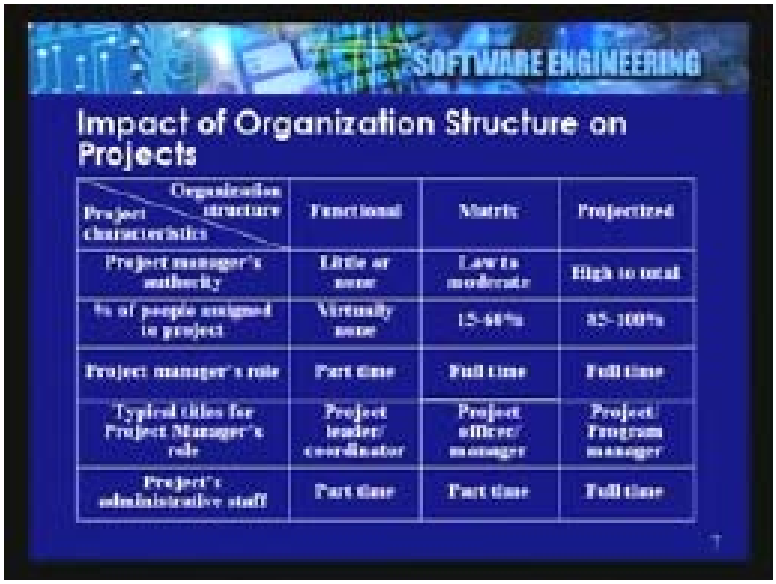

Now IS work is affected by many things like take a simple example; demand for maintenance work is increasing but people are not willing to work on maintenance jobs. Availability of packages is increasing but we still are not very sure how to integrate various packages with other activities that we are doing. End user development is on the raise but we are worried about a quality associated with the end user development.

There are other aspects like development activities getting automated and less and less intervention is required at the down stream part of software engineering. Similarly, there is a wide variation in the project challenges and from one project to another there are lots of differences that come. Last but not the least we have a very serious problem with matching the jobs and the individuals. Most of the times we end up assigning a low end job to a highly qualified person where we have a problem and similarly in case we have an unqualified person working on another job we have another particular problem. So people factor is a very important factor in IS work. It is because if you look at the IS professional basically their organizational commitment is very low whereas their professional commitment is very high.

Development work obviously preferred to maintenance and challenging work and learning opportunities are looked up to whereas the routine work is not really sought after. People want to work only on the latest technology and so on. Their growth needs are higher but their social needs are relatively low, turnover is very high, there is a little slow down recently because of general job market environment but otherwise IT professional turnover is very high. And we have other problems like people grow too fast and social support that you need to provide to a young manager is very different than the kind of thing that needs to be provided.

Similarly, what kind of organization structures that you follow also makes a lot of difference?

There are different types of organizational structure. At one end there are organizations which are functionally oriented and have few projects and there are at the other extreme project ties organizations which do most of their work as projects. Obviously different characteristics associated with the project will change from one type to another and in between obviously you have middle overload kind of a thing, you may have a matrix type of organization where you are trying to sort of eat the cake and achieve best of both the worlds of both the functional and the project type structure.

Now if you look at the slide you find that the project manager's authority for instance is relatively low in a functional organization but is very high when it comes to a project tied organization. Then the percentage of people assigned entirely to the project is low in case of functional and very high in case of this thing. Similarly, you look at all these projects the project manger's role will be part time but here it will have to be a full time role. Then you go next step further and typical titles also will make a difference.

Therefore, in one particular case you are designated as a project manager, then you might be designated as a project coordinator and last but not the least the administrative staff may be present, lot of administrator staffs may be available in a project title organization whereas you might have to make do with a part time kind of staff in other situations.

Organizational HR planning process involves identifying, documenting and assessing various project roles such as roles, responsibilities and reporting relationships so these can be assigned either to individuals or to groups and individuals or the groups may be part of either the performing organization or part of the external or the extended organization. Much of an HR planning process gets done early in the project's life like project role, responsibility, assignments, staffing, organization chart etc. Results of this process however need to be reviewed regularly and like any other particular planning activity periodically you need to review that whether this particular plan is working properly or not.

Another thing is, since we are working in a performing organization the planning of the performing organization and the project HR planning must be very closely tied to each other. Now let us look at what typically is an organizational structure within a project. So now we look at the slide.

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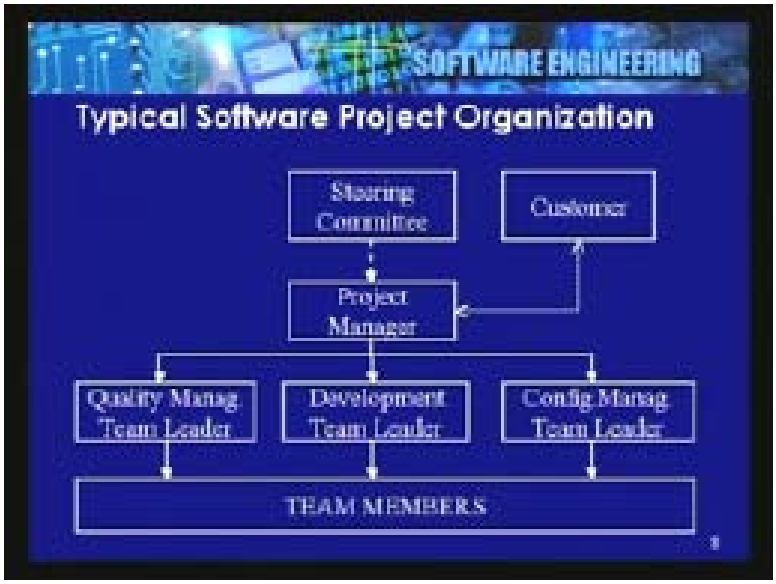

We have a project manager and the project manager basically vows his existence to somebody in the performing organization, some kind of a steering committee but he has one more boss so he has to deal with the customer of course it could be in the same organization or it could be from another organization. Then under the project manager there are the development teams.

The project may be split into smaller segments and the responsibility for development of different segments may be given to different people. in addition to that usually a project has two other types of activity; one is quality team leader, the person within the project who is responsible for ensuring that the project work is done so that the quality will be achieved.

Please remember ensuring quality is the responsibility of the performing organization, it is not the responsibility of the quality assurance department. So, from that point of view the quality assurance department of the organization will play an advisory role whereas your particular quality project quality team leader will really ensure that your project is performing the way it is supposed to be. Again if you look at the slide we have one more particular role and that is the role of a configuration team manager. These particular roles are very obvious in all projects.

Now we ask another question; who are the people who are responsible for software development and we say that the responsibility for software development is with all the stake holders in a different way. As we see here in the slide we have a list of people who are responsible software development.

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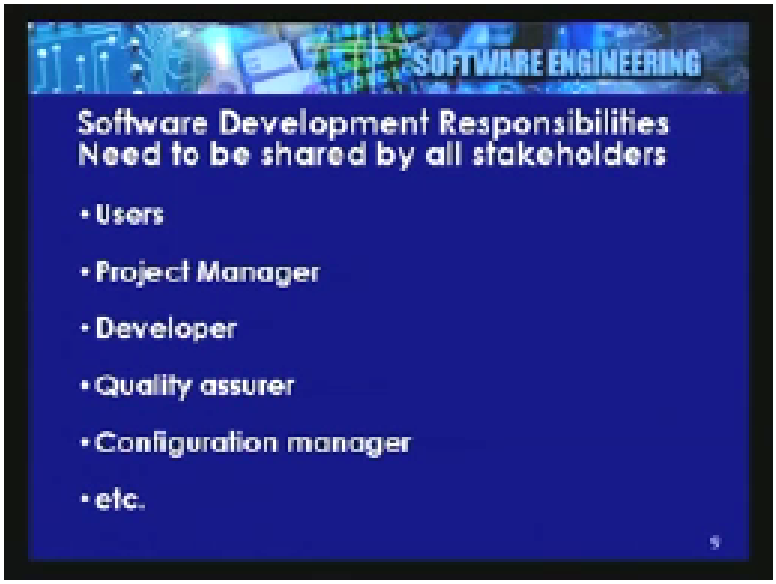

First we have the user. It is essential that the users be involved in functional requirements like giving details like performance, volume, environment, constraints, acceptance criteria and of course the responsibility of accepting the product. The project manger is responsible for planning, monitoring, control, adhering to time, cost, budgets and managing the change changes to requirements that may happen. The developer is responsible for considering the alternative solutions and designing and developing the system according to the requirements. The quality assurance team is responsible for ensuring completeness, consistency and traceability and last but not the least the configuration manager is responsible for ensuring that the product integrity is maintained.

So if you look at the slide again all these people have an important role to play in any particular project. The responsibility for software development is not only with the software developers or the software development project manager. So, every project will typically have a role responsibility matrix of the type that we have seen.

If we look at the slide again we have on one side the persons that we have with us Jagdish, Nayan, Mohan, Neeta, Arun and we have different phases of the project like requirement, high level design, low level design, development and the testing. Then we have situations like each of these people have different role to play.

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The role may be only being a participant in the group or it may be accountability or it may be review responsibility or it may responsibility for giving inputs or it may be the responsibility of signing of that particular project. So, different people from that particular point of view have a different role and responsibility that is assigned. Once we got this particular job done the first question that comes to our mind is to know exactly what we want, what type of people we want and how do we acquire the staff.

Hence PL needs to get appropriate resources allocated to the project. This can be done either by assigning resources from within the organization or for acquiring them from outside. If you are a project tied organization the chances are that the staff will be allocated to your project and if you are like a one of project you may have to rely on hiring people from outside on a temporary basis or sub contracting or outsourcing this kind of job. Therefore strong influencing and negotiating skills are very essential for the project manager to make sure that the internal resources are allocated the right quality and at the right time in the right quantity also. Thus acquiring and retaining IT professional is a very complex activity and good procedures are required for hiring new people or sub contracting them.

Similarly organizations need to offer different types of benefits and flexibilities etc for retaining people. So like the HR function as we know like recruitment, retainment and retirement acquisition is also a very important activity. In most cases the organization may not allocate the best resources to every project because it is not possible to do that. Thus often you should never be worried about whether you got the best resources or the worst but what you should be worried about is if the resource appropriate for the work that you are doing. Therefore as long as the resources that you get are commensurate with the expectation that you have from these particular resources you are really not worried where else they affect in the organizational structure. So, allocation of resources is a very important activity. Now once we got these people we need to do team development.

Now remember, if we have a project people have been assembled quote and quote from different sources to work on a project and they are going to disband as soon as the project is over. So there are advantages and disadvantages of doing this particular thing. From the resource utilization point of view this is a best strategy but there are some other negative implications of doing it in this particular way.

Once the project manager gets these resources the next job is to make sure that he makes them function like a team. Like in the olden days we used to have a tape drive, the tape drive unlike a disk never kept moving and every time you wanted to record something it started moving and you had to wait until it achieved a full speed and similarly when the recording was completed it had to stop and it had to come from full speed back to zero. So there is to be the concept of this leading to what we call inter record gap. By the same particular token the project manager is interested in making sure that these inter record gap kind of a situation is minimized.

So what he needs to do?
Once he gets the project and the resources you need to make sure that the project as a whole starts functioning as a one cohesive unit as soon as possible. Therefore the team development processes are very important. Team development is aimed at helping the people to work together effectively. Understand that there is a lot of difference between capable people and people working as a team.

Here is an example; in case people working in a team was automatic we never should have a doubles match, in tennis like the French open that is going on or the Wimbledon that will be coming very soon we should say that people who comes first and second in the singles match together will be the best pair and you always see that nothing of the sort. So Paes and Boopathy might be able to achieve a doubles title but probably they may not even come up in the rankings in the singles matches. So the team work is very important.

Team development involves both enhancing the ability of the stake holders to contribute to the project and enhancing the ability of the project assigned to function as a team. Hence team building of a project becomes complicated when the assigned employees have multiple responsibilities. Suppose you have people working for you part time then it is more difficult for you to do this particular team development kind of activity.

Similarly, matrix reporting structure itself has its own disadvantages as it has its own advantages. So, team development techniques include team building activities, training, rewards, recognition, providing challenging environment co-location of people and all kinds of things.

Team development process ultimately results in improvement in performance of the team as a whole, the second is, it also provides an input to the performance appraisal. At the end of the year somewhere down the line somebody has to do this particular appraisal kind of a thing. So we have human resources. The next thing we have is project communications management. This particular process is often misunderstood, the term

communication here we talk about is nothing do with communication the loose sense that we normally use, ability to speak, read, write correctly and all that is not what we are taking about.

When you have a project and many people are involved working on a project and many stake holders are there then the communication between these people needs to be formally planned. So the project communication provides the critical link between the people, ideas, information, data and all that. So, project communication is not the same as the communication skills.

Project communications management is aimed at ensuring that timely and appropriate generation, collection, designation and storage and ultimate disposals of project data takes place. You must realize that every member of the project team must be prepared to send and receive communication from other members and also understand how this particular information that is being sent to and fro is going to be utilized by those particular people. If you look at the slide now we have different project communications processes.

First we have communication planning process. Everything starts with planning then you need to have information distribution process. We need to decide how this particular information is going to be distributed. One of the important aspects of distribution is performance reporting. Performance reporting plays a very important role in a project's life. And last but not the least the administrative closure is very important.

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So, if we were look at the communications planning process starts with understanding the information and the communication needs of all the stake holders. Once you identify the needs you will need to provide suitable needs for providing this information together. So whether you need to put it on a website, broadcast it, e-mail it, verbally communicate it,

informally communicate etc are all a part of that particular process. The information needs and methods of communication have a wide variety of techniques available for doing this and from that point of view selecting an appropriate technique is very important.

Communications planning is usually done early in the project's phase and communication planning is tightly linked to the organizational planning. Similarly, like in many other processes the performing organization may itself has certain kind of project reporting structures and from that point of view you need to make sure that your process is able to feed appropriate communication also to the performing organization. Therefore what are the things that we get at the end of this particular job?
One is we get a communications management plan.

So if you look at the slide again it shows typically a communications management plan. So we have stake holders along one particular line. We have not put the names here but customer management, customer technical staff, the internal management, the internal technical staff, the training sub contractors, software sub contractors and whoever may be involved in that particular thing.

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Then we ask which kind of report the person must get, the monthly status report or training plan or software implementation schedule or something like that. Then we ask the next question that what kind of format he needs to get it. So it may need a hard copy or e-mail or a intranet web display or something like that on one particular type. In case there are several people involved here we need to identify the name of the contact person or a single person to whom this communication is going to be directed. So, if the customer management person is Jollien and the customer technical staff is manohar and Ruchi Roy and Sathish and Sandhya and Vivek and all kinds of people are involved then this communication is directed to them.

Once we have identified the communication we need to plan for the distribution. Distribution of information is as important preparing the requirements. Hence information distribution involves making information available to the stake holders. If there is more than one information distribution then we need to say create and send a status report and hold periodic meetings. So this kind of information distribution can also take place. It is not just restricted to sending a report so holding a periodic meeting also is a part of the communication.

So information distribution includes implementation of communications management plan and responding to unplanned request for information that may arise from different stake holders as per their authorization. So responsibility for project communication management should be spread across the entire organization and different people should be responsible for sending that particular kind of thing. Typically the information distribution process outputs will be, one will be the project records and the project reports and the project presentations of different kinds.

Information distribution methods, the other methods like meetings and other things are supplemented by a wide variety of applications or the oral communication skills.
Remember, the hard copies and all that are fine but, for instance listening skills, interpersonal skills, meeting management skills, team building skills, proposal preparation skills, awareness training skills, complaint resolutions, interviewing negotiating, facilitating, conflict resolution, influencing scheme you name it and there are a whole sort of applications of oral communication skills which sit on top of all the formal communication that takes place.

In the performance reporting phase what we are involved in is keeping the stake holders involved about how the project resources are being used to achieve the project objectives. it involves collecting dissimilating appropriate performance data and reporting takes place from the status report, progress report, forecasting and it is in this particular context if you were to look at the slide now let us see how this particular information flows.

Suppose we have a project action based on all the information that comes like actioning means something that requires your particular action. At the lowest level we have the project level internal meetings that may be happening. So internal project meetings will also provide project level information, consolidation and this particular data is given. At the next level we may have customer level kind of a thing, the status reporting that you have, the customer reviews of the status report will also provide inputs for actioning. Then you have the steering committee that really is the project manager’s boss and you are sending them steering status reports and this particular steering meetings may also lead to lot of inputs for taking action. And last but not the least a lot of issues may crop up for reasons best note to Almighty.

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From that particular point of view we need to have several issue resolutions meeting. Issue resolutions meeting are the only things which are not planned in the project plan; they take place as and when required. But basically what you are saying is, like whenever you have this kind of a structure and communication this communication leads to a lot of information being sent within the project and within the stake holders and of course from within the project to outside the project and receiving the data from outside the project to inside the project.

The administrative closure in a theoretical sense occurred at the end of the project but as we have seen earlier it overlaps with some part of the project and it continues well after technically the project is complete.

If you look at the slide the administrative closure process involves collecting the project records, ensuring that they reflect the final product that we have delivered and hoping that it is according to the specification then it involves analyzing the project's success and effectiveness and making sure that the lessons learnt are appropriately digested in the project processes, matrices and the checklist and last but not the least archiving the information for future use. So, updating the employee skills, database and reflecting new skills that have been learnt by the people while doing this particular project are the kind of activities that has come here. The administrative closure process output basically gives you outputs like formal acceptance, project archives, project closures and the lessons learnt.

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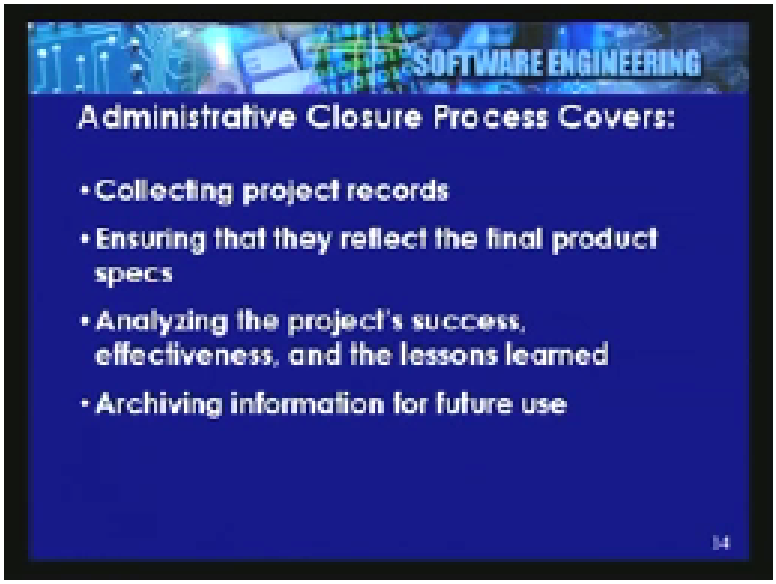

Documentation filing is a very important activity though it seems to be like taken for granted. The need for good documentation need not be over stressed, software must be extensible, reusable, and maintainable, it cannot be done unless you have good documentation and this documentation is collected properly and maintained properly and modified properly. You are not going to get the job done.

This documentation may be used either within the organization or outside the organization. For instance, the user manual is being used by the users. So document filing issues are like; what are the inputs, the deliverables, the work products, the standards and other documents like plans, exemptions, guidelines and record of data, reviewing of the records, test record etc, so how do you store them, how do you access control them and who authorizes whom to use this particular data. Therefore the last part of the project communication that is the project documentation is concerned with everybody in the project.

Now we come to the next process procurement. For a variety of reasons an organization may not like to get the entire job done by resources within the organization but they prefer to procure resources, outsource resources from somewhere else. Procurement means acquiring goods and services from an outside organization.

Therefore an organization outsource products and services for a variety of reasons like it may reduce fixed and a recurring cost, the vendor takes the benefit of volumes and the scales. There are many illustrations that can be given. For instance, somebody who is contracting with Kodak for photographs may contract for a million photographs and sell in turns at a discounted price to various people at a price below the retail price at which the Kodak sells the photograph. Similarly, you might get benefited by reducing the fixed and the recurring cost because that is the only job that the vendor does.

Focus on core competencies: again you do not want to flitter away your energies into doing things which you are really good at in which case it will be better to outsource such a work if the frequency and the requirement is not very often. On a lighter side it is like a hospital having to subcontract the catering or the laundry or some such particular kind of activity. By a similar token many software activities can be sub contracted.

A good example of this would be like in case you are interested in developing some drivers for certain laboratory equipments of a pathology laboratory and integrate this particular drivers into your system it may be too cumbersome for you to write drivers for equipments with which you are not familiar but on the other hand it may be far easier for you to get it done or buy it readymade from the market.

Then gain access to skills and technology which you do not have. Another one is to provide flexibility, leveling of resources, scheduling convenience and obviously increasing accountability of the contractors by putting them under legal binding. So there are many reasons why people procure things. Many purchases are done in this particular manner. Procurement management processes include the following processes that we are talking about.

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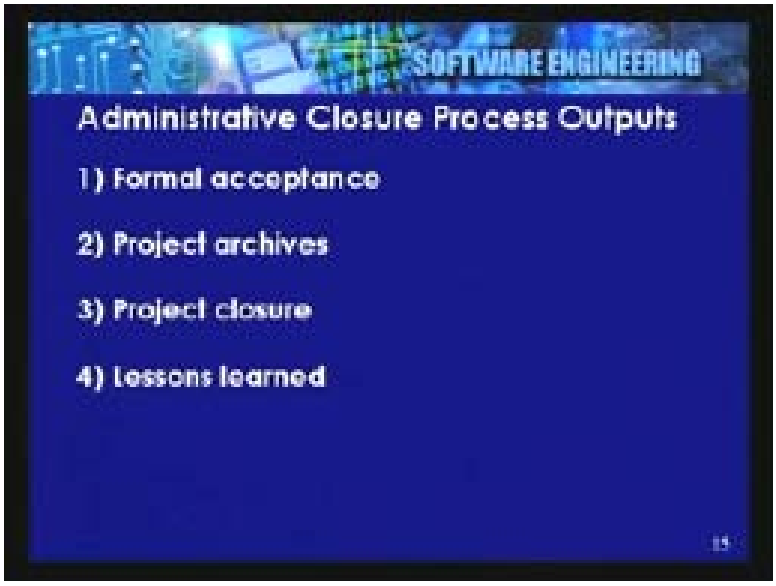

The first and the foremost we are talking about is the procurement planning process. First decision that we need to take is decide what do you wish to procure from outside. So the [38:27] decision procurement management plan and statement of work etc need to go there. Then you need to do solicitation planning. What is solicitation planning?
You need to request for proposals, the people competent to do that particular job, you like them to bid for your particular thing.

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Solicitation planning is like; who will you approach, how you will approach, how many people will you approach and what type of decisions will you take and when etc. If you look at the slide again you have the actual solicitation. This involves physically following up with the vendors and contacting them and providing them the information to make sure that they feel interested and quote for that particular job.

Once various people have quoted for that your next responsibility is to source selection that one of these proposals you have received should be the one to get the job. Once you have done that the next thing is contract administration. You will have to make a contract with the selected contractor and then make sure that the contract is being adhered to. And last but not the least at appropriate point of time you need to close the contract. Thus all these things are required to be done in a procurement kind of a situation.

Now we come to the most important knowledge area and that is called as project integration management. What does the project integration management involve?
project integration management involve, if you look at the slide again, on one side the eight knowledge areas that we have talked about and the evolution of the project as it happens and during that particular time you need to make sure that these individual knowledge area processes are working well over the entire life of the particular project so that the project succeeds in a true sense.

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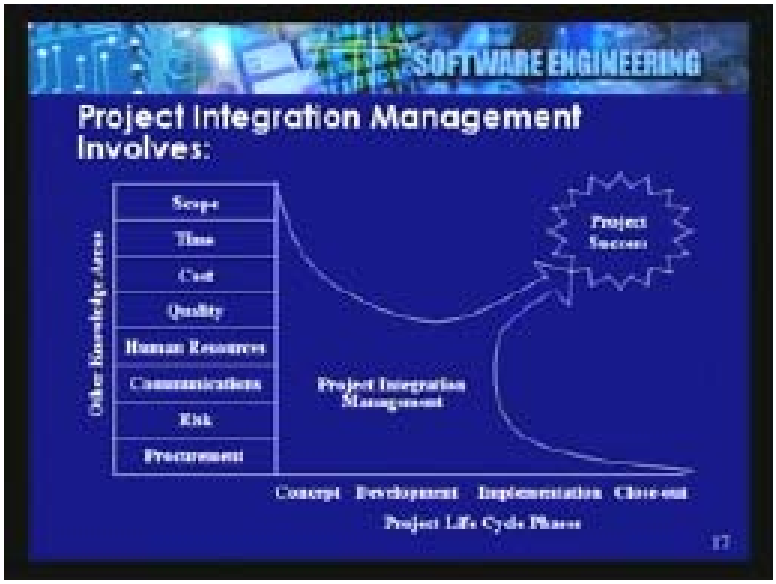

Project integration management ties together the activities from all other knowledge areas. It includes processes necessary to coordinate the eight knowledge areas that we have talked about and there is something that has to be done throughout the project's life cycle. Therefore project integration management ensures that all elements for instance come together at the right time and project work integrates with the organizational operations and the project scope integrates with the product scope and so on and so forth. So, successful integration requires commitment and the support of both the top management and the executive management of the organization.

Integration management process group consist of three subprocesses. If you look at the slide again first is we have a project plan development process, then a project plan execution process and overall change control process.

What is the project plan development process?
project plan development process basically involves making sure that the individual plans as are made and of course revised or integrated from the eight knowledge areas make sense when you tie them together. It is also lot of compromising. Hence integrated management control plans that the total scope of the project is evolved.

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The entire work is defined, planned, estimated, authorized and schedules are all made. This process uses the outputs from the other planning areas including strategic planning from outside the organization also. It inherently must iterate several times. It is not possible to get things right at one particular short. like we mentioned earlier though we studied the eight knowledge areas separately putting them together is really not a joke and neither can these eight knowledge areas prepare their plans in isolation, there is lot of interconnection that goes on in that particular thing.

Typically what are the outputs that you get from the project?
If you look at the slide again the outputs from the project plan development process are basically all the things that we need for guiding the project execution, documenting the project planning assumption in addition to project plan, then documenting the basis for selection, the facilitating communication, defining contents and the timings of management reviews and providing a baseline for project control etc all these details of output are used particularly.

Now once you got the project plan and all these other details right the next thing you are going to do is the project plan execution process. Now the project plan execution process is the primary process for implementing a project. This process is directly affected by the project's application area since this is when the actual product really is going to get created. During the project plan execution phase the project team produces the project's product and the project manager leads the team and manages all the stake holder relationships during this particular period.

Managing and performing the work described in the project plan is not an easy job. So most of the continuous monitoring is required and you must know in advance when you are going to monitor what. Most of the project's time and budget is spent on project

execution and continuous monitoring from that point of view is very essential making sure that the base lines are adhered to.

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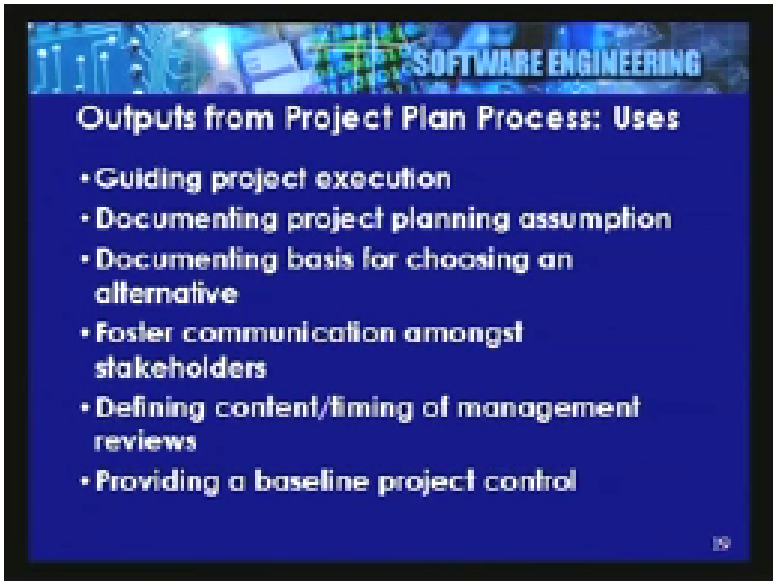

So periodic forecasts of final cost and schedules also need to be done and in general you need to make sure that the project is on the right time, any corrective actions that need to be taken may also have to be taken.

Management of software project execution is specially designed for managing the particular job and many software tools can also be used for doing this kind of a thing. Typically if you have to use product like Microsoft's MS project it can greatly assist in creating and executing the project plan and hyperlinks to all kinds of things that you want are for used and grant charts and other schedules that you may be having, link to deliverables and test plans and team members can use this software for updating the project progress and resource utilization kind of thing and PM can use it for comparing the base lines with the actuals and generating various kinds of reports. Although these tools and techniques help a PM in project execution the key lies in positive leadership. The key is not the tool but the key is the leadership. In order to focus his attention on positive leadership a project manager must delegate a lot of these detailed work and use the tools to make sure that they were been properly used.

Another important process that we have in overall integration is the overall change control. Again we saw every knowledge area always started with planning and ended with change control. By the same token all the change control themselves need to be integrated. So the overall change control involves identifying, evaluating and managing the changes throughout the project's life cycle in all areas.

If you look at the slide again the objective of the overall project plan control process are; first to influence the factors that create the changes. Our basic objective is to ensure that the changes are minimal and if they do occur they are beneficial.

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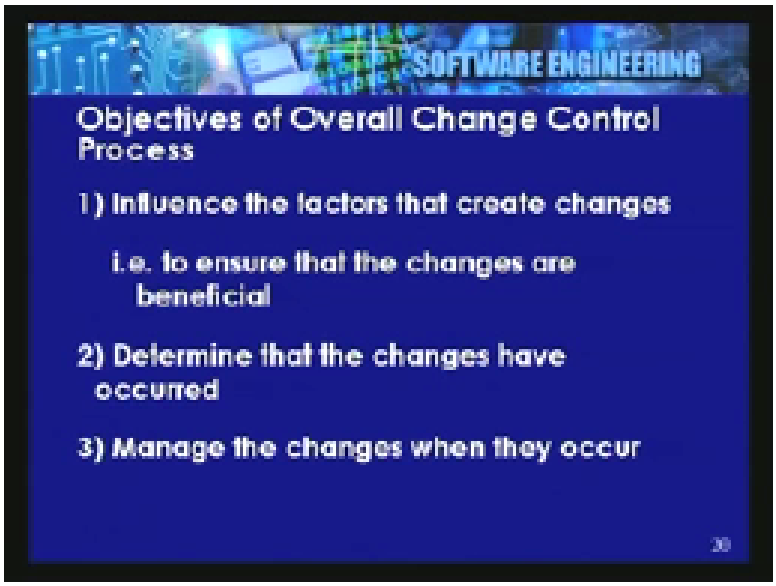

Second particular part is determining that the changes have occurred in the way we think they have occurred. And last but not the least managing the changes when they occur because you would not like the changes to occur as and when.

Therefore from that particular point of view integrated change control process involves first ensuring that the changes to a product scope are reflected in the definition of the scope, the coordinating changes across the knowledge areas like proposed schedules and all that are affecting all the other areas that we have done and maintain the integrity of the performance base line. Hence all these things need to be managed by the particular thing. While you are doing this another particular issue is there and that is organizational learning. We have already said you cannot keep on making the same mistakes all over again and the organization must learn from the past mistakes.

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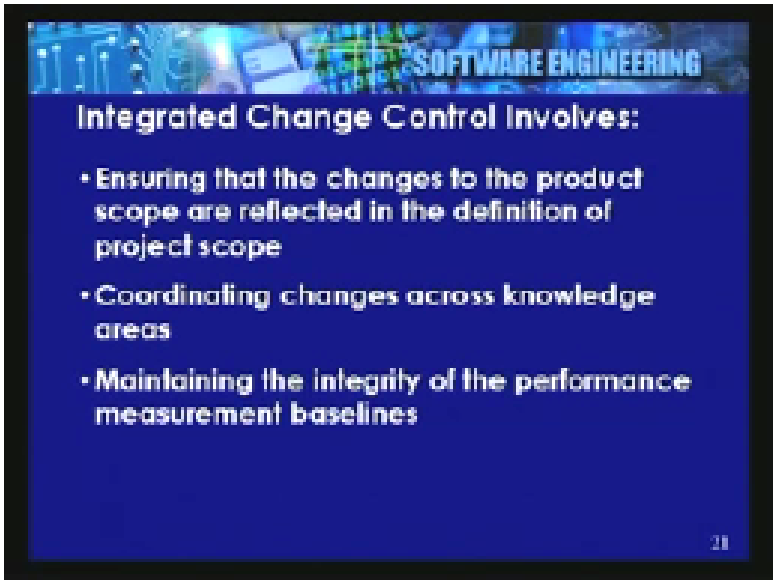

From that point of view organizational learning is a process of identifying and correcting the errors and once the errors are corrected we need to make sure that the experience that we gain while detecting and corrected the errors is stored somewhere in the appropriate area.

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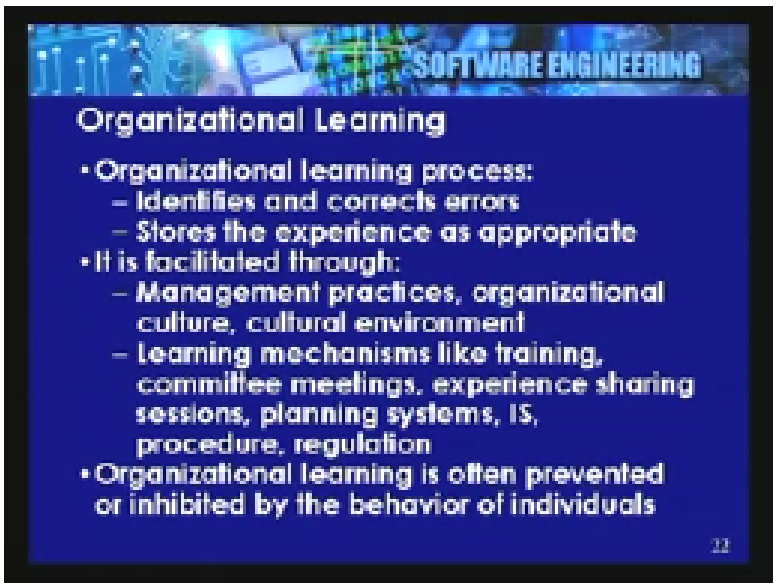

That is one particular thing to be noted, storing the experience is very important. it may take the form of procedures, forms, rules, systems training, clear guidance and all kinds of things.

Another thing is the organizational learning is facilitated through management practices, organizational cultures, environment that you are living in, then learning mechanisms like training, committee meeting, experience sharing, planning systems, procedures and all that and last but not the least the organizational learning should not really be prevented or inhibited by the behavior of the individual. It is very essential to make sure that the accumulation or experience is not in anyway a particular thing. Because for many reasons like self-interest, perception of good ways of working, threatened feeling due to discoveries or something like that the employees may or may not be interested in sharing all their opinions.

Now, what role does the project manager play in a project?
What you must realize is that there are three sets of people involved in that particular role. One is the project manager himself. Now the project manager on one hand required interacting with the top management then with the line management and he is responsible for coordinating and integrating the activities across the line functions.

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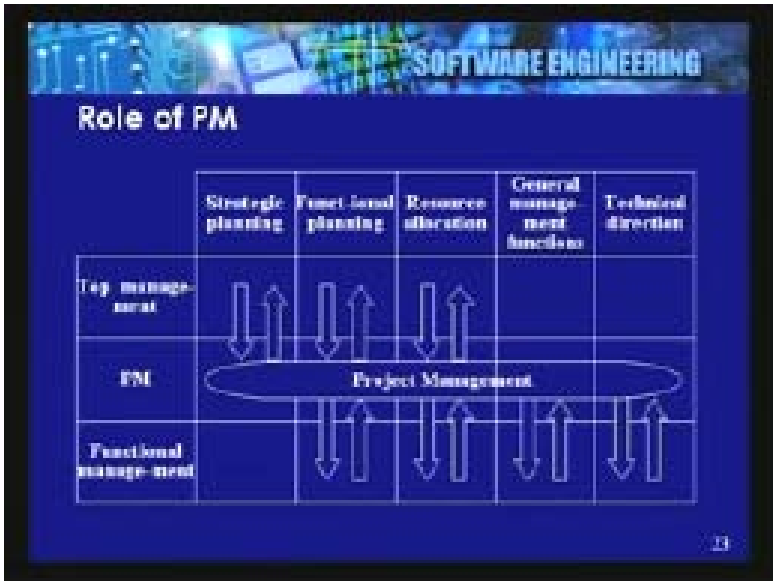

In that particular sense a PM has more responsibility and less authority and needs to manage these interfaces with both the top management and the functional management. So if you look at the slide you see that on one particular slide the project manager needs to interact with the top management in terms of strategic planning, functional planning and resource allocation kind of a thing, the project manager has to interact with these people and on the other hand the project manager needs to interact with the functional management. These are the people who really hold resources and hopefully according to the directions of the top management they cooperate with the project manager. Therefore, functional planning, resource allocation, general management functions and the technical directions etc all these activities require continuous interaction on part of the manager.

If you look at it from that point of view a project manager is required to have wide variety of skills. So PM is responsible for assuring that the project's goals are achieved and the budget is assured, the schedules are kept up to date and from that point of view he needs to also make sure that with inadequate authority he is still performing the job well. So from that aspect he must rely on excellent negotiation and persuasion skills.

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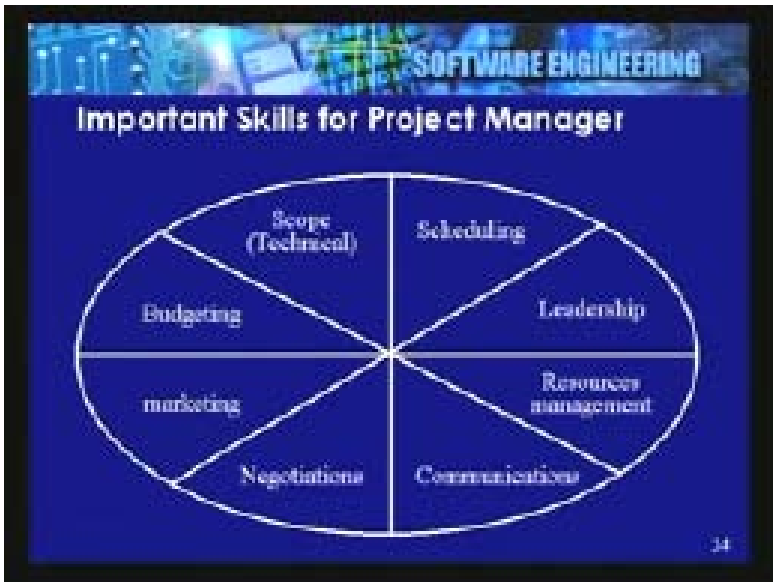

If you look at the slide you see the wide variety of skills that a project manager requires.
So mind you, the technical skills we take of a project manger we take for granted but he also is required to have skills like leadership and resource manager, communications and negotiations and marketing and budgeting. If he does all these things in addition to his professional job then the chances are that he will do an excellent job as a project manager.

The project manager is required to perform a lot of functions like defining the scope, identifying stake holders and work breakdown structures and estimations and risk evaluations and contingency plans and project reviews, participations and all that and from that point of view he needs to demonstrate lot of leaderships skills, some kind of visioning, technical competence, decisiveness, be a good motivator, good communicator and so on and so forth.

We often end up with engineers who are required to undertake a project management job so that itself poses certain problems. So if you look at the slide now what do normally engineers do and what the managers do?
The engineers are all aiming at minimizing the risk, emphasizing accuracy and they are worried about mathematical precision whereas the manager is supposed to take calculative risk, rely heavily on intuition and make educated guesses in the phase of incomplete information.

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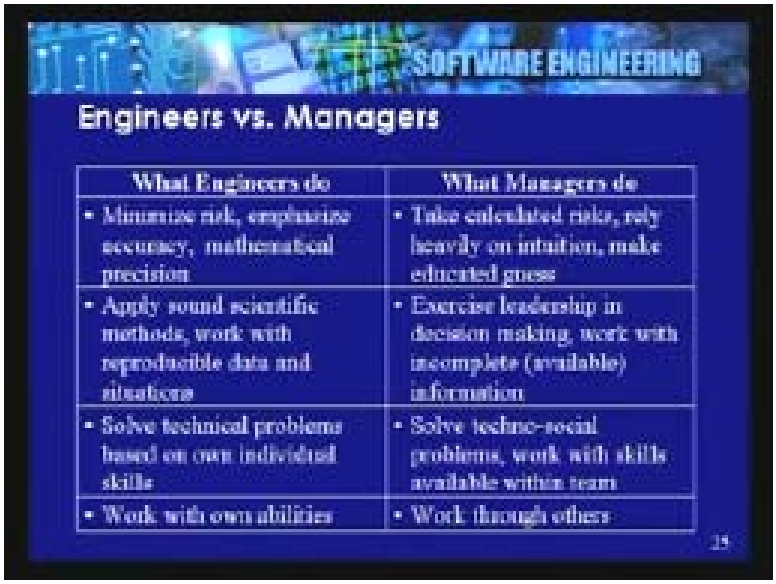

Then the engineer typically applies some scientific knowledge to data and situations and equations and that sort of a thing whereas a manager is really required to exercise leadership in decision making. It is not doing it yourself, getting it done, working with incomplete information and all these things. And last but not the least solely the people work with technical problems only, the engineers work with engineering problems and from that point of view you need to make sure that the manager needs to start working through others. A very important thing is to do it yourself and getting things done. This is what basically we looked at.

Therefore, in case we are now transitioning from that particular situation that is from an engineer to a manager you need to take certain kind of decision. The engineer must get propelled into management for economic considerations and the desire to accept more responsibility and all that and the new perspectives must be required to be sort of brought into his training, teaching and bringing him up, things like leadership, detailed planning, risk taking, working through others and something that does not come in engineering education, managerial satisfaction also comes through achieving the work through others rather than doing it yourself.

So, conceptualizing a system is more to be done by the manager and implementing can often can be delegated to this thing. Therefore it is nothing but exercising authority and at the same time making other people do that particular job. The critical skills required for transformation are basically learning to trust others, learning to work through others and learning to derive satisfaction from the work done by other people.

So that is the end of our project management sessions.