Software Engineering
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Lecture - 36
6B. Quality Management Systems

We now continue our session on Quality Management Systems. We have studied Malcolm Baldrige National Quality Award and ISO 9000 models. Now let us look at one more model called CMMI Capability Maturity Model Integrated proposed by software engineering institute located at Carnegie Mellon University in USA.

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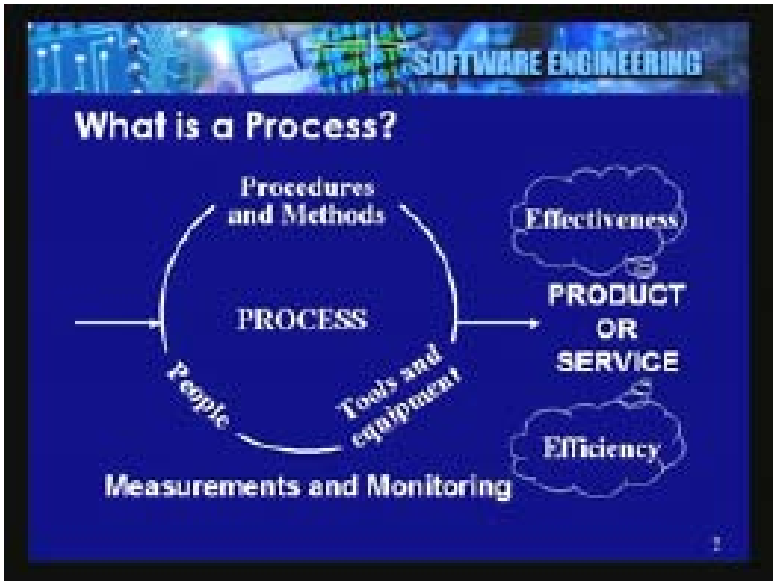

Basically this particular model is exclusively aimed at software businesses. So from that point of you its relevance is highest to software development practices. We begin this particular concept of capability, maturity by basically understanding what we mean by a process. If you look at the slide we have a process. So process is the set of activities methods, practices and tools and whatever else required that help people in developing and maintaining systems. So you get an input you have an output results in a product or service then the focus is on people, procedures, methods, tools, equipment and last but not the least all the time you are measuring and monitoring what is happening.

There are two things which are important. One is the efficiency and the other is the effectiveness of this particular process. Obviously efficiency indicates how well the resources are consumed for making the product and effectiveness indicates the appropriateness of the product for the intended use. So from this particular point of view if you were to look at it we need to understand to terms, what is the process capability and what is process maturity.

Now if you look at the slides again process capability is what we talk of something that indicates the range of results that can be expected by adhering to the process.

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So if you were to follow this particular process again and again what kind of an outcome will you get? In that particular sense it is a predictor of the project outcome.

Quality of a product is very heavily influenced by the quality of the process and from that particular point of view capability is a very important consideration. The process maturity indicates the extent to which a process is explicitly defined, managed, measured, controlled and in short it is effective.

So, if you were to look at a matured process for instance it is consistent with the way work gets done like what you say and what you do is similar, it is well defined, it is well understood and it is used in a consistent manner throughout the organization. So it allows people to fully exploit their potential for developing the particular product. But not only that, it is also amenable to improvement. So once you have a document at process we can think of improving it in an on-going basis. Therefore process maturity is basically something that is a measurable indicator of the process quality. A process maturity is a measurable indicator of the process quality.

Now we look at the next particular thing. What we mean by a maturity level. Again if you look at the slide the main objective behind defining the maturity level is to achieve a control and a measured process as a foundation for continuing improvement.

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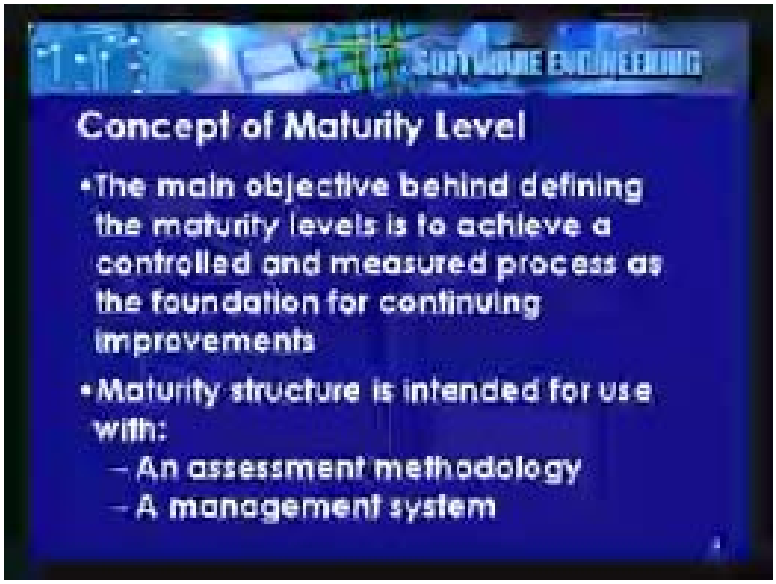

Let us understand this in a little more detail now. First, the levels that we define must be reasonably realistic in the sense that they must represent the actual historical phases of evolution and of course the improvements that are followed in an organization not one organization but in a group of organizations. They must also represent a measure of improvement that is reasonable to achieve from the prior level to the next level. It is like indicating that there being multiple steps to go from one level to another and the other is each particular step being realistic enough to be climbed.

So once we have done that we say that maturity structure is intended for use with a specific assessment methodology and a management system. What it means is our organization should be in a position to do a self assessment about the current maturity status. And obviously once you got the current maturity status you will think in terms of improvement. So it should provide a structure for prioritizing the improvements in the organizational context. So, if you have a concept of this particular maturity levels then we are going to be using this particular data for a variety of reasons.

Once the organization's maturity level is defined then concentrating on the next level is easy, you also know what exactly your weaknesses are and where you need to put in effort to do the improvement. So, if a project planning system is ineffective in your organization, it is not possible to introduce advanced methods in technology because they would not really give you any great deal of benefit, actually it will add to the confusion.

Therefore, we need to first make sure that we have a project planning system in place and obviously as and when required if there are appropriate time we could bring in more advanced methodology and technology for doing that particular thing. Therefore maturity levels are very useful from that particular point of view. Now let us look at what we call as Capability Maturity Models.

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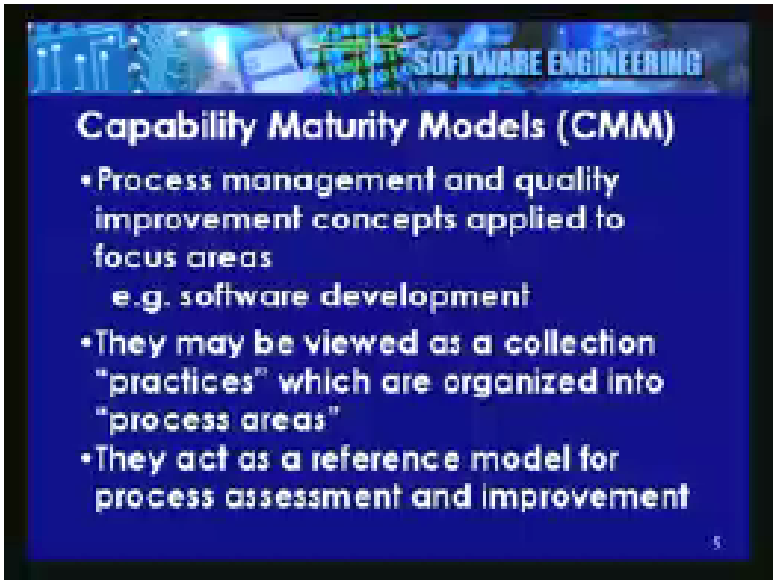

If you again look at the slide we say what Capability Maturity Model is. Capability Maturity Model is a process management and quality improvement concept applicable in different focus areas.

If software development was your focus area you could develop a Capability Maturity Model for that. If you are interested in system development including software, hardware, telecommunication, integration, implementation etc then you could develop a Capability Maturity Model for that also. In case you are getting the work done in a contracted fashion one could develop the Capability Maturity Model for that purpose also. As we see here in the slide the Capability Maturity Models may be viewed as a collection of practices which an organization follows.

Basically these practices can also be grouped into process areas. These are the terminologies which are very specific to different models that we use so we have different practices which are grouped at process areas and ultimately it gives you the complete Capability Maturity Model. These particular models act as a reference model for process assessment and improvement. Again this is like background music but all the time we keep on remembering it.

If you do not know where you are and where you want to go, measurement and improvement are central to all activities we are talking about. So the Capability Maturity Models are very useful in that particular sense. There are several Capability Maturity Models which got evolved over time.

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If you look at the slide again the most well known is the software CMM which is talked of very often in the software industry, then there is a system engineering CMM, then there is a integrated product development CMM and there is software acquisition CMM and then there is a people CMM and CMM's and CMM's and CMM's. Once you have so many CMM's you are in trouble because you might want to follow more than one.

For instance, your company may be interested in doing software development and also interested in the total solution providing kind of a business in which case you might be required to follow two models. Once we have multiple models that an organization is required to follow we run into many problems. We have different architectures, different terminologies, and different processes and then the concept of improvement also varies from one model to another. So, from this particular point of view if you had am integrated kind of a model then this is likely to help you a great deal.

If you look at the slide again you say the motivation behind having an integrated model is to provide one model across the entire lifecycle. That means there is a means of integrating multiple assessment activities, training and so on and so forth.

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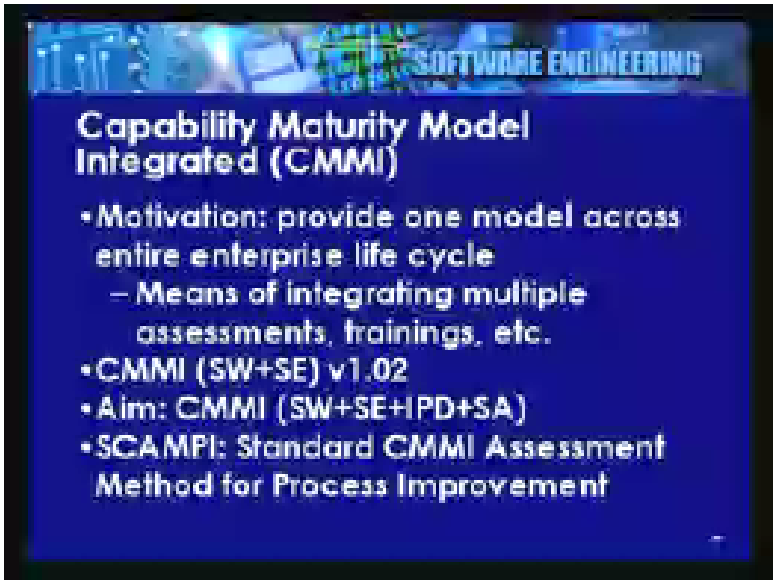

So, different models can be clubbed together to form a new model. So we have CMMI software and systems version 1.02 and the ultimate aim is to have a CMMI which integrates four norm models software systems, getting the product done and acquisition of the product etc.

Therefore sub-contracting, acquisition, system engineering, software all these things if we put together under a common model then an organization need not have multiple models that it follows for a different purpose. A common model will suit the requirement and obviously in the common model we will ignore those particular aspects of the model which are not relevant for a specific project and those can be ruled out. So another major advantage is that the assessment method for the Capability Maturity Model will also be uniform.

So if you look at the slide again we can have SCAMPI the Standard CMMI Assessment Method for Process Improvement as a method which is used for assessing each particular organization on the CMMI that is whichever particular phase we are trying to work on. When SCI went from CMM software to CMMI obviously a lot of good things from other models came in and probably other segments benefited from the practices followed in the software kind of area.

So, looking at a quote and quote the market requirements the CMMI was provided in a tailorable kind of a fashion and they provide two different ways in which you can apply a CMMI. One is known as a staged model and other is a continuous model. The two models are only apparently different but not conceptually. The soundness and evaluation and the criteria for both the models are exactly the same. It is like saying that if we had a set of things and a set of bags how will you really like to organize the packing and may be one person would like to pack it in one way and another person would like to pack the bags in another way. So, if you look at a slide now on one particular side we have a

staged model. In a stage model you have five levels from initial, managed, defined, quantitatively managed and optimizing.

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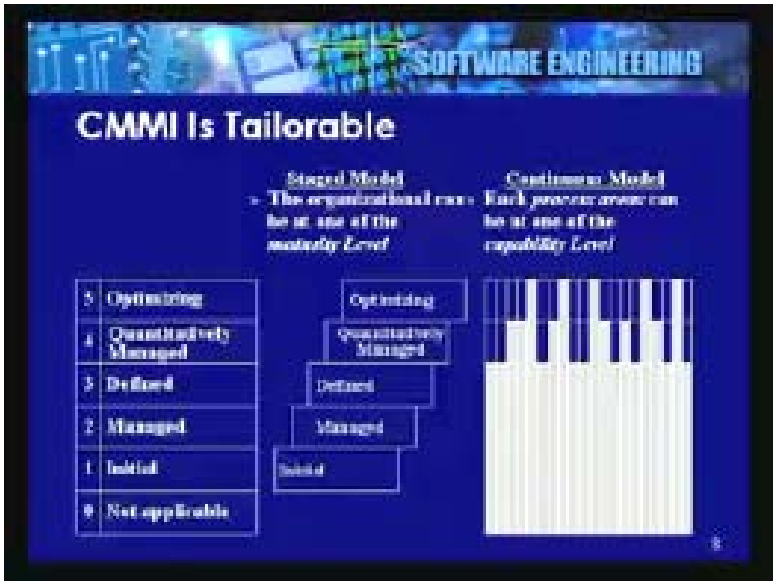

For those of you who might be familiar with your CMM software these levels were previously called by slightly different names like initial and repeatable, defined and managed and optimizing with minor particular differences otherwise conceptually it remained the same. So we have five levels which you need to go through.

In the diagram again it is showing that as you go from initial to manage to define to quantitatively manage to optimizing kind of levels obviously there is no concept of not applicable. This is the very fact that you want to be assessed for a particular model itself puts you in the earlier concept at level one. Level one means basically you are willing to be assessed and true levels beyond zero really were 1 and 2, 3, 4, 5. So, in this particular approach the organization can be at one level and it would like to progress to the next level. You cannot go from level 2 to level 4 you have to go to level 4. you cannot say that you are at level 2 unless you have met all the earlier requirements obviously which is nil, you cannot go to level 3 unless you have met level 2 and so on and so forth.

Now if you were to look at the continuous particular model that you have, again look at the diagram, all these models basically even the stage model consists of process areas. There are twenty two process areas and in the continuous model you are assessed in each of these twenty two areas. And if you really want to be at level 5 something in the staged particular model you need to be minimum at level 3 in all the twenty two areas and achieve 4 and 5 levels in reasonable number of areas and then only you are in a position to be assessed at level 5. But basically here what it says is you have twenty two areas and on each of these particular areas the assessment method will tell you as to what level do you have.

So here you have the concept of the six particular things that the particular process area may not be applicable. So you have areas like not applicable, initial, managed, defined, quantitatively managed, and optimizing. In one particular case you are calling it as a maturity level and in the other case you are calling it as a capability level. There are some differences in the two terminologies but basically you are looking at that particular kind of a situation. Therefore first let us look at the staged model and then lot of overlap and learning will take place about a continuous model and we need not spend as much time on the continuous model because of many of the concepts that we look at in the stage model will also be applicable to the continuous model. So if you look at the slide again you will see a staged model.

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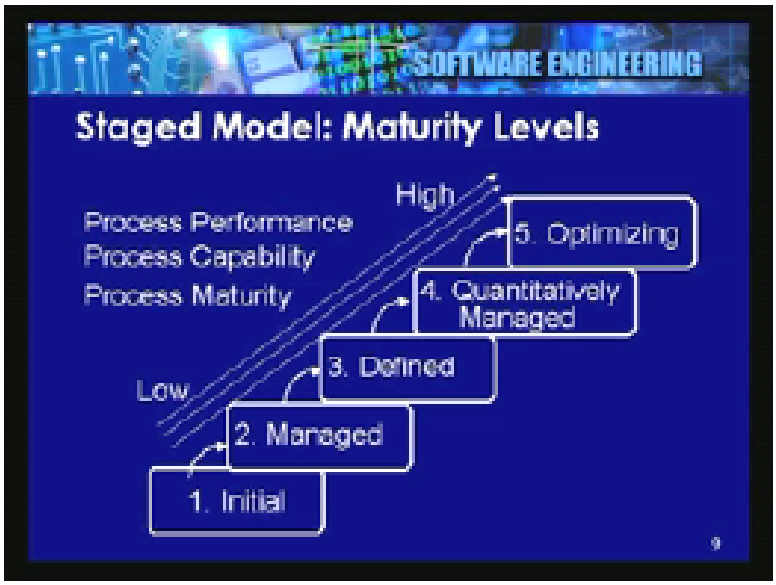

What you are basically seeing is you are going from one level to next, to next, to next, to next that is from low to high and what you are basically doing is process performance is being measured, process capability is being measured, process maturity is being measured and you are improving in all these particular things and as you go on improving you keep on going from one level to another. So let us not try to understand what really is involved in this particular level.

Let us look at the levels in little more detail. If you want to look at these levels a little more in detail then we can draw another maturity level structure and we can evolve this particular structure as we progress from level to level. As you see here in the slide we have a first particular level, what are we doing at level 1?

In level one you have an activity and this particular activity produces some kind of results. And the level as it says here it says just do it. What does it really mean?

First we can say that the environment is not very stable for developing and maintaining the system. It works but it is not a stable environment. Then the engineering practices and

the management practices are not very satisfactory. Remember, at the background the things just keep on happening.

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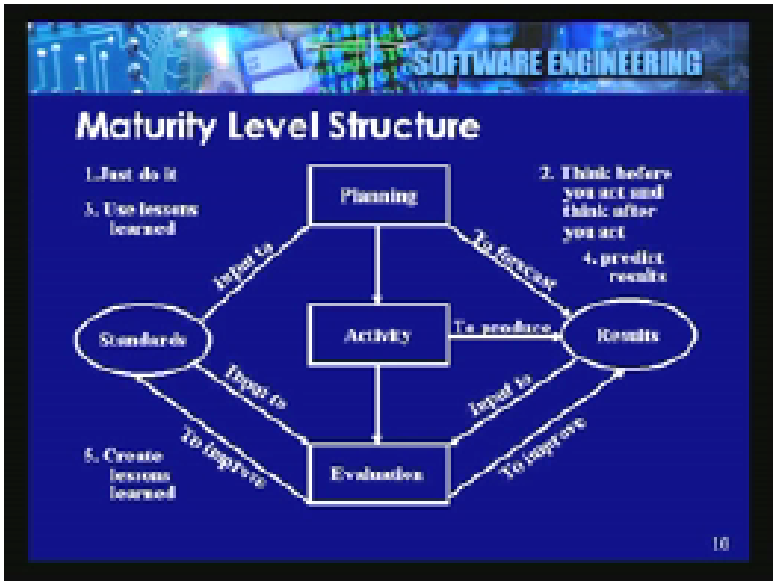

Planning is very low, ineffective, what we are having basically is a reaction driven system. The commitment is based on the reaction. If you fall behind you apply more resources or something like that so we react rather than preempt things. The emphasis is always during testing. And especially more the crisis more rigorously you try to test which really can put you in a bigger soup. So, success depends basically on having exceptional people. Unless you have good people that is the only way, you are able to achieve your job but with God on your side. Thus, unpredictable process capabilities, unpredictable budgets, functionality, quality and if at all few stable processes is all the capital that you got when you are at level 1.

Let us look the slide again; when you want to go from level 1 to level 2 what do we really want?
The first thing that we want to do is we need to start planning. then we need to have some kind of a feedback coming in so we need to have what we plan as a result get the feedback and to keep on improving the results based on the evaluation. So, planning and evaluation are the two particular things that we add here and from that particular point of view you say that the simple rule is; think before you act and think after you act, it is like a catch word, think before you act and think after you act.

Now what are we doing at level 2?
Basically at level two we are a little disciplined organization. The policies exist for managing the project, some kind of planning takes place though it may be largely based on experience, successful practices are largely repeatable, processes are implemented though all projects in the company may not follow the same processes but the projects do define the processes before starting the project, the commitments that we make in terms

of cost, schedule and quality are realistic enough so we do this and better track all these things, the cost schedule and quality are tracked so that we are always going as planned. Requirements and work products are base line.

Standards are defined and they are confirmed to and a strong customer supplier relationship exists and measurement process basically is in place. So the concept of planning, executing, measuring, getting a feedback from the measurements and improvement are the catch particular words. Now once we are at level 2 what we need to do is to go to level 3. So again if you look at the slide what do we do in level 3?

In level three what we are trying to do is to have web possible organization-wide standards. So we are basically using our lessons that we have learnt and based on that we establish standards and we provide an input both for planning and for evaluation of the project. So, at the define level or at the standards and the consistency level that we have the organization has standard processes which are used across the organization by almost all the projects.

Effective engineering practices are also there, the integration of engineering processes and the management processes is well done, the reuse of organizational learning like we say err, err and err but less, less and less so that even if you have to make a mistake make sure that you learn from the mistake and do not repeat the same mistake again. Then you have separate processing engineering groups which concentrate only on improving the processes, and learn from the past experience and improves the processes.

Training programs need to be organized on an organizational basis so that all the people understand the same process the way it is documented and practices exactly the same particular way. So, defining a process by itself is not enough unless people are trained to use that particular process. This indicates that at level 3 basically you have a good management insight into the technical process that the project is making.

Obviously once you are at defined level it does not make sense to stay at the defined level. What you need to really do is to ensure that you do adhere to that defined standards and the procedures or whatever things you have defined. Again if you have to go from level 3 to level 4 what will we do?

Look at the slide again. What we are doing now is we have started using our past experience to predict the outcomes. So one is to plan, other is to predict. Of course the planning has to be done based on prediction in the sense that we basically have to see that are we in a position to really sort of achieve the level that we are aiming or the products and the performance and the other measurements that we will be taking that will they really give you the kind of results that you are looking for.

We said quantatory goals so we have a fair idea about what we are expecting and based on that we plan and provide resources. Therefore quantitative goals are provided for projects and the processes. The variations are measured not only at the product level but

also at the process performance level. In course of time you want the process performance to narrow down to a standard kind of a performance.

Meaningful variations can be distinguished from the random variation. Any time you do a measurement you are only approximating the reality and some of it is going to be the error due to the wrong assumptions and the wrong understanding of the subject, the other is going to be the random variation in the measurement process. So we should be in a position to identify the quote and quote, the explained variance and the unexplained variation in this particular kind of job.

Once you start coming to level 4 then the projects that you produce will definitely be of very high quality and obviously the projects will be very controlled. So it is definitely showing that you are making a progress whereby you are managing the projects in a quantitative kind of a manner. You must first realize that we go to optimizing level it is not a destination that we reach and then stay there that nobody can dislodge you there. At level 5 when we talk of optimization we are talking of sort of remaining at level 5 then reaching level 5.

Here when we see the slide, what we are doing is to improve basically create. The lessons learnt in the past that we were talking about is we were only using what we had but now we need to continuously add to our standard procedure so the knowledge base that we have has to keep on widening and in level 5 what we are basically doing is providing an environment in which the pool of knowledge that you have goes on increasing, organization focus is on improvement and now you get both incremental and innovative improvements.

Now, the incremental advances must happen on an ongoing basis like some small improvements and periodically you may have innovative improvements. Suppose there is a breakthrough technology that is available or you evolve a new method or something like that so your improvement optimizing basically means improvement would be coming both in small dosage on an ongoing basis and periodic burst of very innovative kind of an improvement that you will have. Therefore what we are aiming at is a proactive identification of process.

Do not wait for something to go wrong, go and study the things and see that if we can anticipate where things may go wrong and take preemptive kind of action. So the emphasis is on preventing errors. Eliminating the levels obviously is an essential particular part but that is not the main particular focus. Our focus is mainly to prevent things from going on. So cost benefit analyses were to be done at this particular stage then the new technologies and processes will have to be introduced provided they prove to be cost effective.

You are not going to introduce a new technology just because it is available in the market. At this particular level 5 we are going to be very concerned about making changes, how much they cost, how much benefit do we receive and we will have to prove before we adopt new technologies that adopting such a technology will be useful kind of

a thing. Basically these are the levels we have. Once we got this particular level where are we going next?

Again let us look at the slide and let us see, what are the basic organizations of the various goals and practices and the process area?

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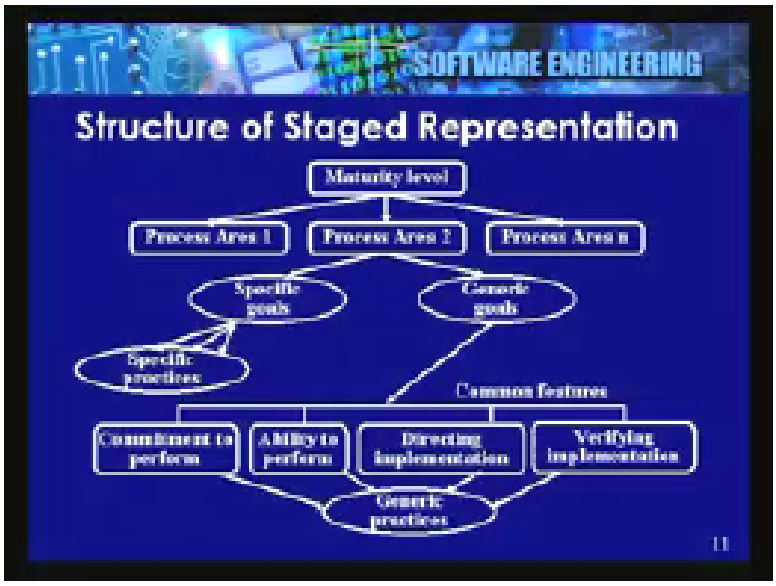

Now if you have to look at it as bottom up kind of approach then very frankly what you see at the bottom wherever you have this hierarchy particular kind of thing is practices, generic practices and specific.

Generic practices are common to everything and specific practices are unique to the specific goals that you have in mind. Now these practices contribute to goals. it shows like one to many kind of a relationship between the goals and practices and these practices with goals that you have basically are attached to the process area. We have twenty two process areas and for each of this particular process areas we have specific goals and generic goals and the specific goals are peculiar to the kind of project that we are doing whereas the generic goals cut across all particular projects and the specific goals will have specific practices. Now let us look at all these things.

First let us understand what a practice is then understand what is a goal and then what is a process area and this collection of process areas together will give you the maturity model and in case you achieve certain process area then each particular process area will indicate at what maturity level your organization stands. Let us start from understanding what is a practice?
Practice is an action performed to achieve a specific goal. Practice basically is to establish estimates for project attributes. If we have this particular kind of a job then we need to specify how this particular job is going to be done. Then for software estimations we may say that use function point, lines of code number of objects, number of

requirements all these kinds of specifications can be given as practices. For system we use data volumes, frequencies, interactions, number of user interfaces etc. So, different types of practices are there. The specific practices differ from one process area to another particular and generic practices are common to all process areas.

From our particular point of view if we were to look at the generic process area they are four of them. Basically it is the commitment to perform. How we prove that appropriate policies and sponsorships is available for achieving what we are planning to achieve. We need to demonstrate a commitment to perform. Next, just commitment is not good enough and you need ability to perform. Things like, the spirit is willing but the flesh is re-kind of approach is not going to work; you need a very healthy spirit followed by a very healthy flesh so it is the ability to perform. Process documentations, resource allocation, assignment of responsibility, trainings etc needs to be taken care of. Once you got the ability and the commitment that also will not make things happen unless you have implementation.

Hence, directing the implementation is very important; measurements, control practices, how do you start, when do you start, when do you finish, how do you report, how do you measure all these things need to be specified. And last but not the least what you need to specify is verifying.

You might do a good implementation but you may not be very sure that the things are happening exactly the way so you need a QC, some kind of an ensuring that the implementation is happening. So periodic reviews are also required, management reviews may be required, some kind of auditing may be required etc. So in this particular way you must have some generic practices such as commitment to perform, the ability to perform, directing the implementation and verifying the implementation etc associated with all the particular processes.

Once we got the practice what is the goal?
Goal is the high level outcome to be achieved by implementing practices. The types of goals again can be specific or generic. there is one generic goal like in a per process area so we will say yes we would like to achieve the error levels to be reduced from so many to so many per thousand lines of code. So the same generic goal is applicable to all process areas at the maturity level and from that point of view we would say that obviously all process areas at the higher maturity level must have the generic requirements of the lower levels. There are one to three specific goals that are attributed to each particular process area.

Process area is a set of practices that is needed to confirm to satisfy the goals of that particular process area. Process area is the cluster of related practices basically. There are in all twenty two process areas in CMMI and in stage representation the process areas reside in the maturity level and in a continuous representation the process areas are grouped by the categories like engineering, project management, process management and support. Now if you were to look at this particular thing then let us see what kinds of levels that we are following.

Let us now look at the process areas at different levels in our CMM. At level 1 there are no process areas but if you look at the slide we will have to read through a lot of these areas. These are the areas. You have requirements management, supplier agreement management, project monitoring and control, project planning, measurement and analysis, process and product quality assurance and configuration management.

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So if you look at it from that particular point of view these are the very minimum rudimentary kinds of things that you require for managing a project just to say that you are in a position to run your project in a predictable kind of a manner. So the term is “manage”. But like we said we still continue to have God on our side.

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Then we go to level 3. What are the processes that we have? Level 3 is the toughest. Look at the number of areas that we have.

First is requirement development. This is akin to what we often call system analysis. They have technical solution that might correspond with something like a higher level design, lower level design and all that. Then we have a concept of product integration. once we have the individual components ready they need to be put together and how we put together needs to be planned at the technical solution stage and then verification and validation, we have already seen the concept of how verification validation are different. So, after coding you need to for instance make sure that the code is according to specification and the code also is consistent with the requirements.

Then we introduced concepts like risk management. Then we have integrated project management. This particular concept is, in case you have software development and communications and you have other particular areas then integrated project management becomes very important. Organizational process focus: you should strive all the time and say do not do something unless we have defined a particular process. Therefore focus is the background music, process, process, process, write it down and do it according to it. Once you got the focus the definition is the particular part and then we got the process defined you need to train the people in using that particular process.

Remember, there is lot of difference between writing it down and people using it the way it is intended to be used. Decision analysis and resolution in terms of any conflict because at each of these particular levels we are going to have plenty of conflicts and how do you resolve this particular thing. You need to have a formal way in which the data is analyzed and then the decisions are taken so database decision making will be at this particular level. When we go from level 3 to level 4 you suddenly find in terms that the number of process areas is very few.

If you look at the slide again we have only two; quantitative project management. We have already seen this particular aspect. What we mean by this is, our data shows that what is the recorded data not for one instance but over a prolonged period of time and then how this particular data is being used for doing the management. Then we have the organizational process performance. You need to worry whether the processes are performing as planned and unless the processes perform as planned it is meaningless because you may say one thing but it may not achieve the kind of levels that you want.

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Once you have done that then the level 5 or the optimizing level, it is like nirvana where you go and sort of stay there on an ongoing particular basis. Remember again, that the level 5 is not a one time kind of an achievement. Hence the organizational innovation and deployment is the thing. Therefore on an ongoing basis you need to do the improvements and these innovations need to be put into practice and cause analysis and resolution. Again one particular thing what we are doing is finding out why things went wrong and learning from it and making sure that we improve our pool of standards and practices so that similar mistakes are not happening again and again and again.

So if you were to now look at this kind of a situation let us see what kind of a visibility comes up with these particular processes. So if you go to the slide you will see that when you go from level 1 to level 4 or 5 what is happening is that the process being just like a true black box with nothing known about what is happening inside to start defining it and then define it at a more granular level and then here we start using the feedback and then here we start making the improvements.

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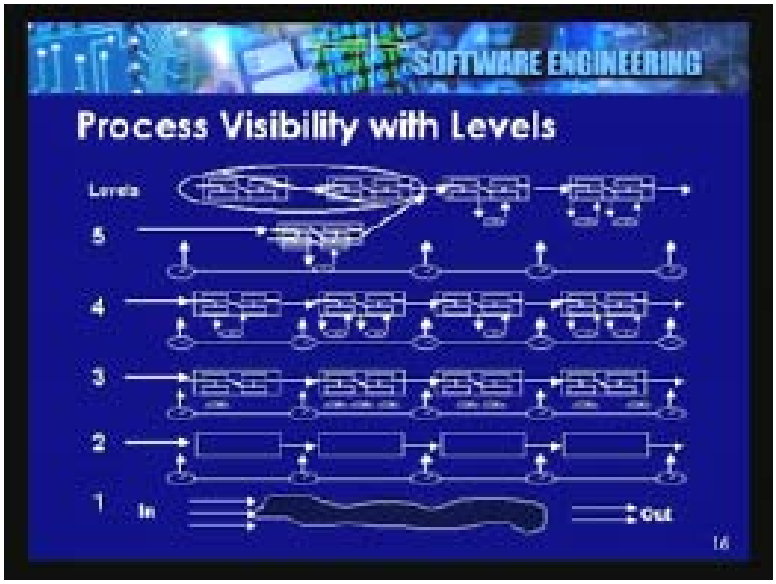

So with this particular kind of approach you will see that there is a great deal of improvement in the process visibility. So you go from one level to another level the visibility will be improving. If you have to see what will happen to the performance then you can look at the next slide.

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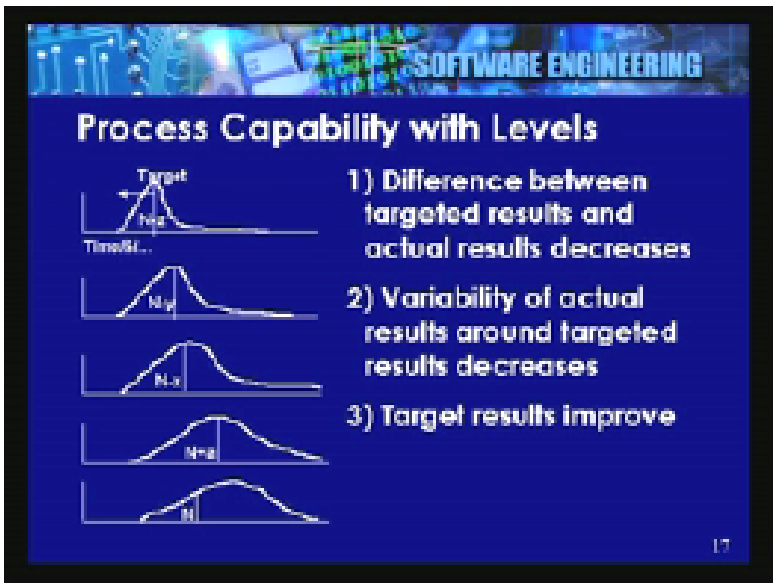

It is the capability, what will happen is when you go from level 1, 2, 3, 4, 5 what is happening is first and foremost the differences between the targeted results and the actual results are reducing. So you are able to target very close to where you want. Second, the variability in performance is going to go down that the distributions are going to become

narrower and narrower and narrower. And what you will basically find is that your target results are improving in the sense that on an ongoing basis the probability of success is going to be very high. So in this particular manner once you go from one level to another you can see distinct improvements.

Now we go to the other model that we have. Now we look at the continuous representation. What you are doing in continuous representation is the components of summarized by process areas rather than as in the earlier case we got them by levels.

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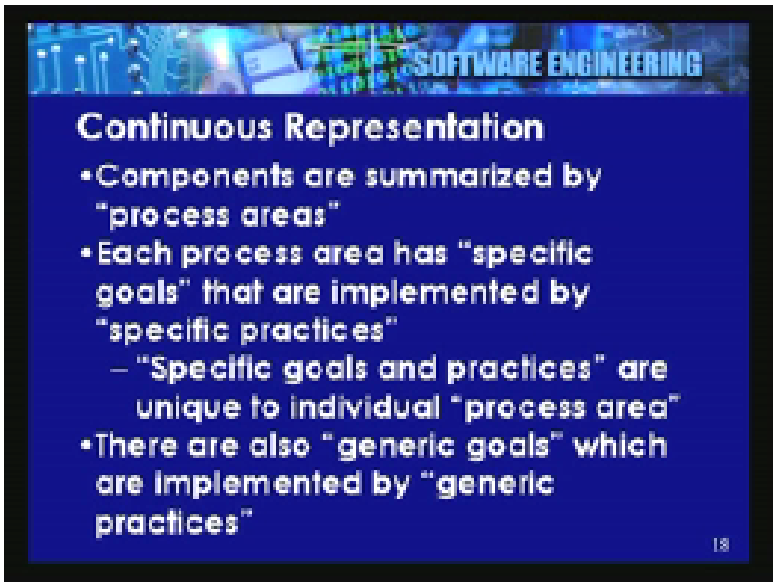

So what happens is that each process area has specific goals and specific practices and the specific goals and practices are again grouped into areas. We apply this particular kind of an approach and then what we see is a slightly different arrangement.

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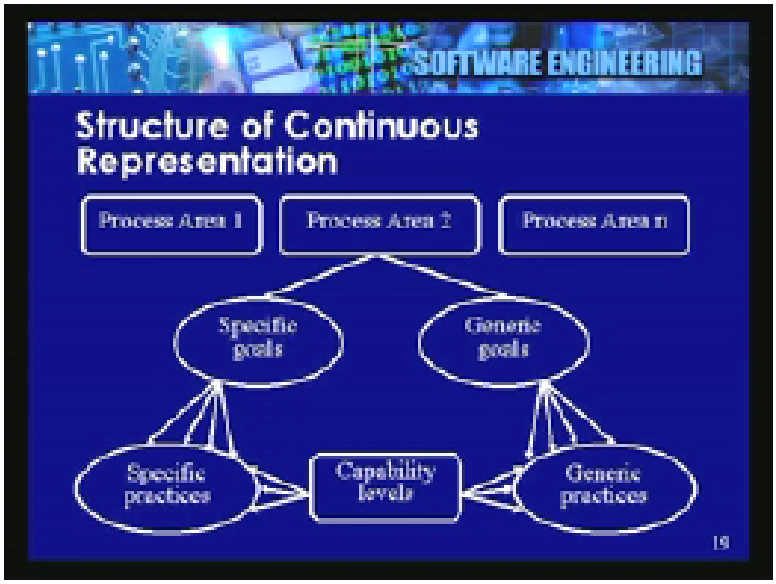

We have capability levels, generic practices, specific practices, goals and process areas but we did not try to have a common structure like the four generic groupings of the generic practices has not been done in this particular kind of a situation.

Key process is a terminology from the earlier models. The process areas as we got in the CMMI are exactly the same. But if you have to now look at the slide you find that the same areas have been organized by different groups. So you have engineering group and the project management and the process management and the support particular group. On this scale they have been organized by maturity levels.

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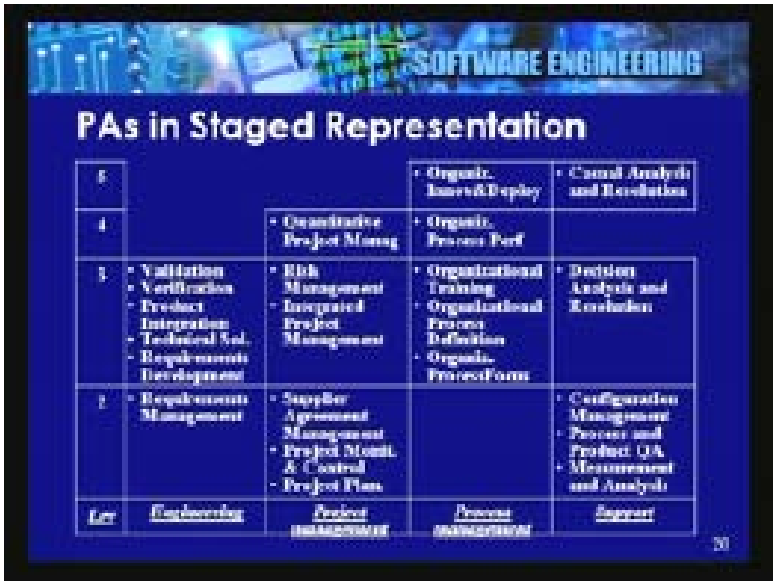

Therefore now what happens is basically the same twenty two process areas have been specified here. Once we got this particular thing then for a continuous model we do the assessment for individual process areas and for maturity level kind of approach we do the assessment level by level.

Now let us look at what are the main differences and similarities between the capability levels and the maturity levels. If you look at the slide again the similarity by design, the granular information contents of the two models are virtually identical and the basis for evaluation of progress in each particular process areas is exactly the same. So there is no difference in that particular way.

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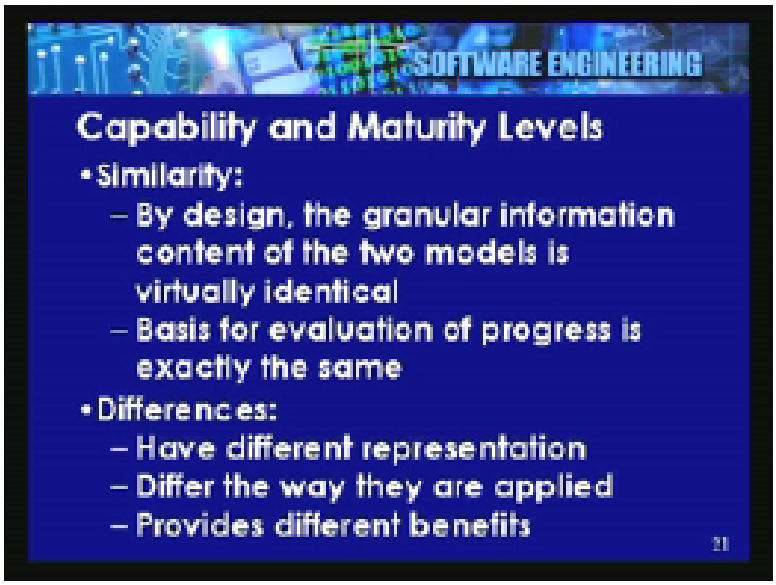

Now what is the difference? They have a different representation of grouping the practices. They differ in the way these particular goals and practices are deployed, applied and improved. Obviously the two provide different benefits. How do these things differ from each other?

What happens is, if you look at the progression point of view in a staged model you introduce a sequence of improvements from the very basic to go from one level to predetermined level to the next level.

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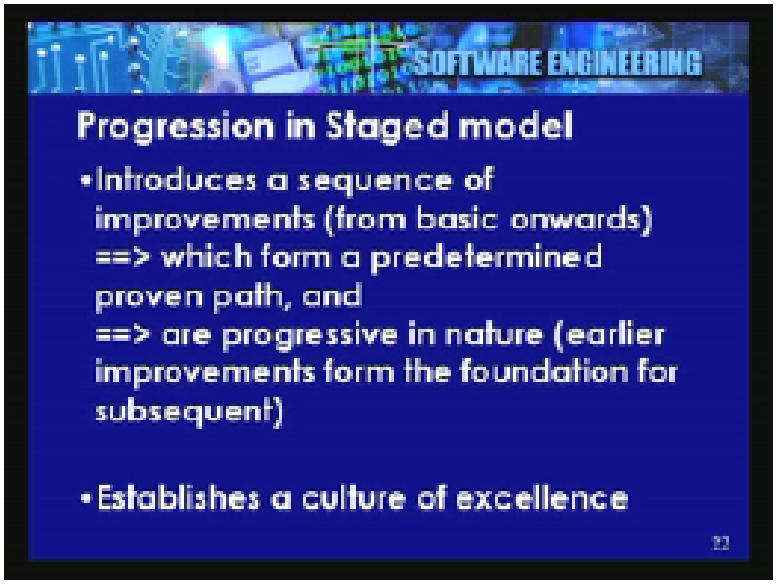

Therefore the path is already (44:24) for you and it is like you got to go from 1 to next, to next, to next and these particular levels are progressive in the sense that level 1 requirements are not there but level 2 requirements are prerequisites for being at level 3 and so on and so forth. So the progression is very gradual from lower level to higher. So you are achieving your overall improvement in the organization's particular practices. As against this we are looking at establishing the culture of excellence in the organization. We say that the organization as a whole we keep on going from one level to next to next.

When we look at the progression or continuous kind of a model progression what it does is you find out which are the areas in which you are weak and then may be you can do a cost benefit analysis or any other thing and say which particular process areas need to be improved and where will you get maximum benefit at minimum cost in minimum time.

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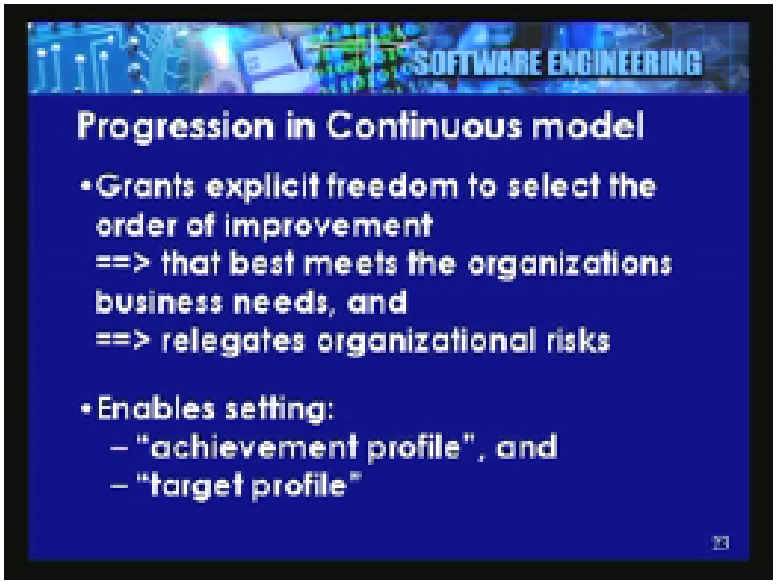

So it grants explicit freedom to select the order of improvement. Understand the difference, in case of the staged model the path is chopped out and in the continuous model you can choose your own particular path that best meets the organization's business needs. Therefore wherever you think is the major weakness that is the thing.

What this particular model does is to allow you to have an achievement profile to say where you are and it also enables you to set a target profile as where you would like to be and one is deciding where you are and the other is deciding where you want to be and then allows you to set your own particular goals so that the improvements can be achieved in a balanced manner. This particular kind of approach is used in a continuous model. Now we ask a simple particular question; what are the other considerations that go into the making of the particular model. So the continuous model increases visibility into capability of individual process area whereas the stage model increases the visibility level by level.

The generic practices from higher capability areas can be applied to other process areas whereas in case of staged model the generic practices are grouped as institutionalized common features and these particular practices need to be followed for all process areas. Similarly, comparison within and across the organization can be done only on a individual process by process basis in a continuous model whereas the stage model enables you to do comparison across the organization from one project to another and also you can do the comparisons from one organization to another organization. So comparison with other standards in that particular stage would be more difficult in a staged area because it is not as granular in structure only 5 levels whereas if you are in a continuous model kind of a situation then like mapping one to one with a ISO model or something will be much easier for you to do.

Now we ask the next buddy how we choose the model. So we ask a question; when should you choose a particular model.

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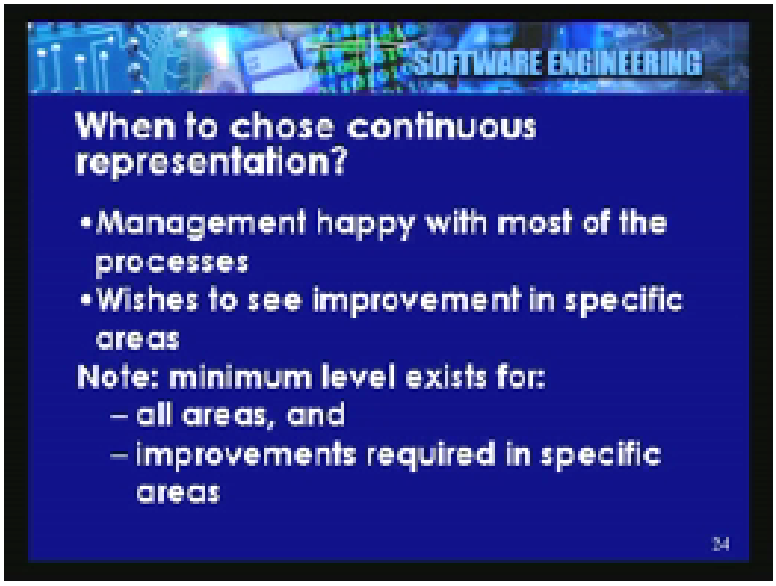

When do we choose a staged model?
We say we choose a staged model when management wants to improve the overall development capability of the organization. The management must want to see an improvement in several areas and it identifies the areas requiring that particular level. So you say you are at level 1, 2, 3, 4, 5. So if you look at it the management wants to improve the overall capability, wishes to see the improvements in several areas and identifies the areas that require attention. Therefore you will choose the continuous model when you are happy with most of the proposals but you see that certain improvements are required in certain areas and then you will do the improvements in those areas.

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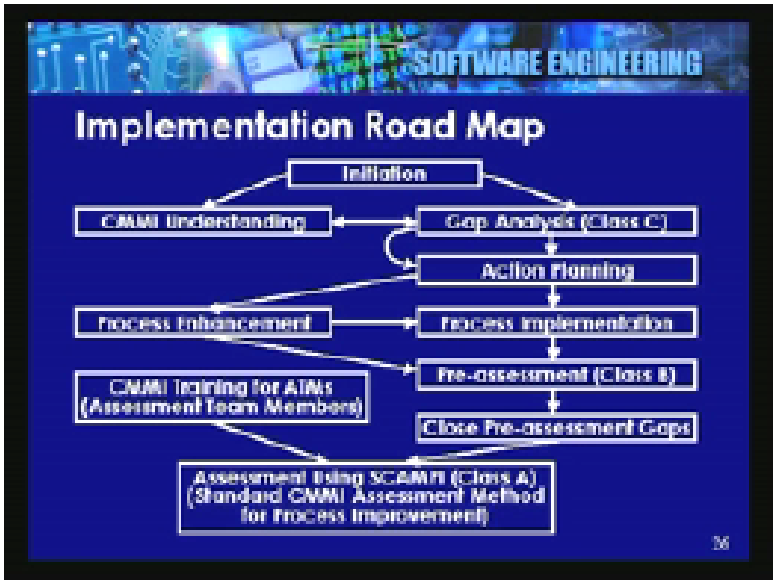

Let us now look at what would be a good road map to achieve the levels. The first thing is you will have to initiate. Somebody must feel like wanting to put the SEI CMM into practice. So what we need to do?
We will initiate the process then we will have some understanding about the FCA CMM what are its levels, models and selection and all that. Then you will have to do a gap analysis at class C.

Now we are using a terminology in terms of doing the assessment first at a macro macro level and then at macro level and then at a micro level kind of a situation. So your gap analysis is done on a basis. Hence once you have got some idea about what are the broad weaknesses that you got in your organization you can start planning to overcome these kinds of weaknesses.

Action planning:
Remember, the whole idea is once the very fact that you want to do an assessment means that you would like to take a step forward and find out where you are weak and those particular activities can be initiated. Once you got the initial class C weaknesses and control the next thing that you are going to do is to do the formal part again. So on one side you are going to do process enhancement.

We will already have some processes in writing but these processes need to be improved on an ongoing basis and improving the process is not good enough the improved process needs to be implemented. So you have the process enhancements and process improvements. You have more and more processes and they are put in practice. And once you have done that you can do a class B kind of assessment, a pre-assessment. And once you do a class B kind of a pre-assessment you will know again where you are lacking and wherever you find the gaps then undertake the closing of the gaps for pre-assessment

kind of activity. Once you have done this then the next particular thing is you would like to have a formal assessment.

Now remember, the emphasis on CMM's is on self assessment. Usually the assessment is done by people within the organization under the guidance of a trained person, somebody who has achieved proficiency and has got a certification in SCAMPI approach method then this particular person is going to do that particular job. So what you are really going to do is when you want to do the formal assessment you are going to systematically identify a group of people so you will make sure that there is no bias in the sense that you pick only favorites or you pick people only from certain areas and not from other areas over one project. Therefore systematically you choose good people.

Those particular assessment team members, as shown in the slide this assessment team members are trained by the leader the 10% who is going to guide the assessment and then it is these ATM's really are the ones who go in the whole company to different areas as it all planned like who is going to go where and do what kind of checking etc. They go and do the relevant measurements and come back and under the guidance of the facilitator all this data is put together and then the group as all keeps on deciding which particular level capability level or the maturity level needs to be assessed and when the entire assessment is complete at the end of it you will get the appropriate certification.

It may be the label of being at a particular level the maturity level or capability level that you are interested in. And remember here we said that the whole process is aimed in such a way that there is no likelihood of your failure. Basically the rate of progress from one end to another end can be slow but under normal circumstances once if you got a will there is always a way to achieve it and you are going to reach that particular level.

The most difficult thing is of course to stay at level 5. Another major particular weakness is that once an organization undergoes a assessment under CMMI it will not obliged to reassess itself though if your have real purpose is to sort of improve your organization then you will continue to do the self assessments on an ongoing basis so that you know exactly where you stand.