Design Practice
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Lecture - 16
Program & product Interface Dimension in Concurrent engineering

Hello and welcome to the design practice module 16. We were talking about the cal CE case study about how to build up a concurrent engineering environmental. In that, we had recorded about 3 different phases of work 1 phase was when we talk about the intrinsic dimensions to setup such an engineering environment, the 3rd, the 2nd phase was about what are the major elements related to setting up that engineering environment or that C environment and then 3rd is of course, once all this is done and you have an ascertainment of what is the current level in which the organization is placed what do you do to make it go forward into a envisioned level.

And that you have to really do through and analysis mode, where you see what is the existing level see what where the organisations have to be in the near future, and then accordingly what all are the parameters which need to be changed between the different sub levels ok, of the different factors which are associated with either the major elements or the product infection dimensions.

So, that CE environment can be mapped suitably into the future according to the requirements. So, for that we had actually framed up a table where we talked about the various levels of the influencing dimensions like product complexity product technology, program structure, program future, competition business relations and steam scope.

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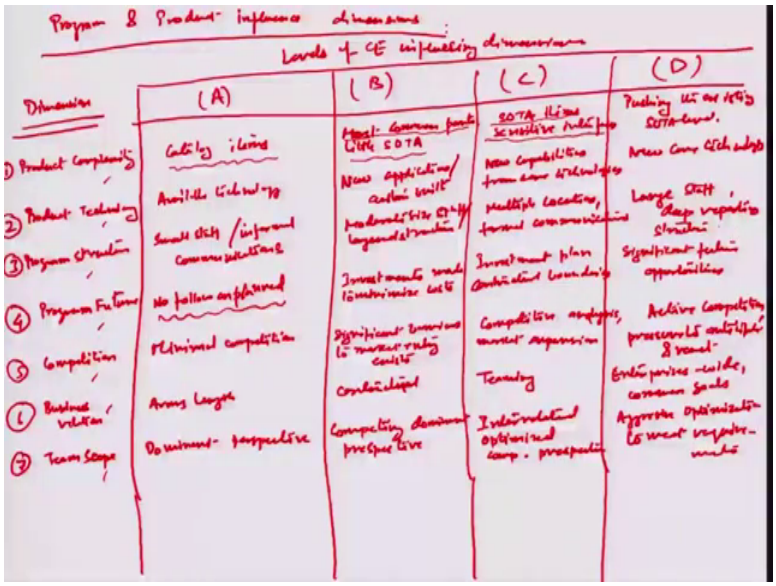

In this, we further categorized the categorize the various levels as starting from the basic level A all the way to D there were 4 different levels.

For example, product complexity could include something like catalogue items which are easily available or most common parts which has little state of the art in it, but you know again it is kind of specific to the product line, which is been concerned. Then you have the state of the items which are very, very sensitive and their only design. For the overall production of this system which is being considered ok. And then of course, we talk about the highest level of pushing the existing sota level state of the art level to a level where you know you have to significantly change the current items to reach that. So, lot of research and development is needed in doing this.

So, in that manner we had mapped all the different dimensions influencing dimensions. Let us look at all the elements now. So, we talked about phase 2 of the c set of process which is about the major elements of the CE environment.

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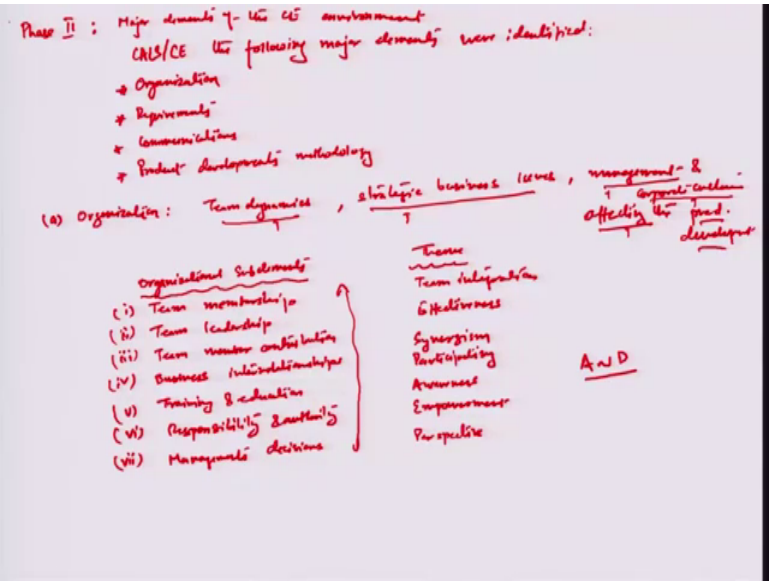

So, we can we can see that in order to characterize this CE environment and examine the relevant aspects. In details particularly in the cals CE case the following major elements were identified this word for example, the organization. So, we had a map into what level the organization is currently in and where we have to take it. Then we then there was another major element of the requirements related to this CE setup.

The concurrent engineering setup then what is the communication mode? Is it a vertical communication? Is it a horizontal communication? Is it something where you have cross functional teams involved in all decision making? So, all these things are communications and then of course, the product development methodology which is being followed.

So, these are the major elements which in the cals CE was considered to be having the major states in setting up the so, called concurrent engineering environment. So, let us look at into the individual scopes of all these elements and see what are the; you know theme is behind the different places of elements which are involved in leading to this major element. For example, if I start with the first aspect that is the organizational aspect let us call this a ok.

So, we call this organizational aspect or organization. So, organizational issues refer to let us say aspects related to team dynamics aspects related to strategic business issues let us say you have vendors as well as dealers and what is your you know point of

contention about the different business relationships is it only a buying selling relationship or it is something which is beyond that do you have a stake holding for example. So, all these things come into the strategic business levels issues.

Then you can have management and corporate culture that affects the product development process as a part of the organization. So, let us just write this record this known as well management and corporate culture affecting the product development process. So, these are the major sort of aspects related to what we know as organizational issues and how can we really categorize the current CE environment into these different issues. So, if you look at different elements here.

For example, let us say if I tried to look at some of these major some elements and tried to formulate what are the reasons why these elements should exist on business canvas. So, let us say we have these organizational sub elements and each of the supplements would be dedicated at a current level 2 words are probably certain theme. So, let us say what is the; aspect because of which this element should exist.

So, there is one aspect here which we may say as team membership. So, the membership should have overall strategy or the theme of team integration ok. So, members should not be looking mostly you know all the way they should have out of the box ideas, but they should eventually lead to an integrated approach for working in a team.

So, people who are team players are preferred in some cases ok. So, there is also an organizational sub element recorded as team leadership. So, the team leadership should have a basic theme of effectiveness. So, for example, you know a team leadership or a leadership role can be typically you know management appointed team leader of management selected team facilitator or again team selected facilitators are sometimes even more effective or then there are may be a possibility that some numbers.

They are naturally emergent has the most knowledgeable leader and that is what service from along a time. So, that affectivity of deploying somebody in the leadership capability may be varied. Based on the approaches, that the organizations use and we will also look at what is least desirable and what is the most desirable in terms of this ABCD scale again? When we talk about developing such an element?

So, we have team membership team leadership as an organizational sub element then we have you know things related to let the team member contribution. Once the theme is formulated, a little disappointed. What is the contribution is it off well defined role of a sudden individual who is a member of a sudden team, that is very important.

So, here there should be a synergistic approach as a basic theme between the different members of their contributions. Do file up together to have the projected projection into what they are projected? Into the overall approach that the team follows are the contributions of the team makes. So, then you have business interrelationships us again another organizational element in this particular case.

So, let us write this down business into relationships and hear the theme be between which it relationship is based in his participation. That how are you just buying and selling kind of relationship or you are beyond that like do you have an have a stake. In the overall well-being of the organization, are you participating is a collaborator or just as a vendor dealer.

So, those interrelationships of different business units are very, very important for CE setup and it is one of the major services. In it is elements again we talked about training here. So, training and education can formulate again organizational aspect of the CE environment or organizational element of the CCE environment. So, this should be based on what is the awareness level Are people needed on the team to be aware of the whole organization dynamics are such or the whole industrial canvas all they are just happy with what they know in the local environment in which they are participating.

And so, based on that the training themes could be different for different categories of C environment then we talked about again responsibility and authority that is another organization an element probably where we will need to identify based around the empowerment theme because; obviously, when there is a certain level of empowerment given to each member as suppose to the leader.

Then obviously, there is responsibility and accountability sort of comes in together and therefore, what is the degree of authority that is invested into an individual team member. It is kind of important in developing how what is what would be the stake holding of that particular member or how closely he will be connected to the overall success decisions related to the C environment.

So, then we again have a supplement of management decisions ok. So, in this particular case the cals CE decides that this is one of the 3 key areas, where the management decisions are based around the theme of perspectives ok. So, perspectives related to whether the decisions are only profit placed or planning base using products and cost accounting models.

All there something related to really life cycle of what you are producing and using the life cycle decision support system to find out what is going to be the critical decisions. So, based on this is there a different levels in which again according to the theme of perspective; you decide what is the level of the current level in the CE environment of management decisions as a sub element of the organizational aspect of the C environment.

So, let us now sort of tried to tabulate all this together in terms of again different levels I would again recall a to d as the 4 different levels of all these different organizational elements. In phase 2, as just we recorded that for the influencing dimension in phase 1 when we are talking about product complexity or product technology etcetera.

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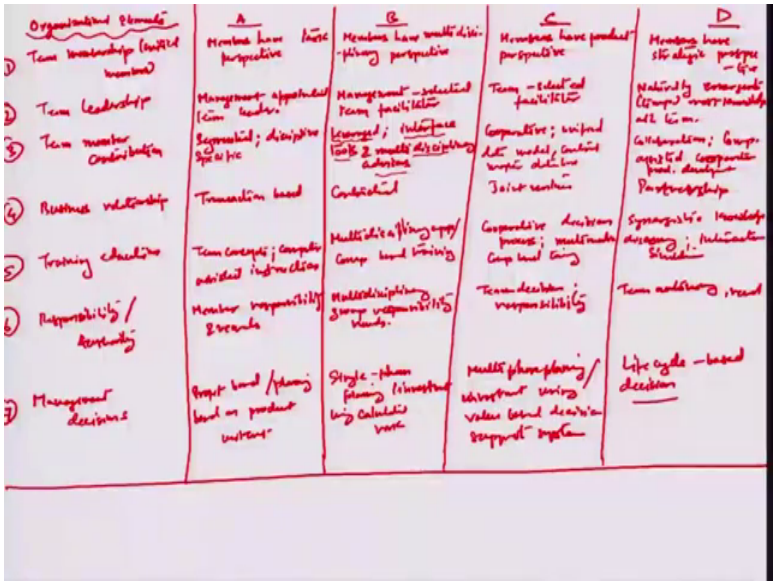

So, here we will like to make you know again, a table which talks about the various organizational elements. And you can see that these organizational elements vary between team membership ok. What is the criticality in terms of who are members and

were not. So, critical members then you have the second factor of the element as team leadership the 3rd level is really related to the team member contribution.

So, this let us write that down here and similarly, you have other factors in these organizational sub elements; which are related to the business interrelationships. Let us say a between the various partners business relationship or for example, training education. How that policies for the current CE setup? Which is existing or for example, the responsibility authority which is vested on individuals and finally, management decision.

So, these were what we agreed upon and the cals CE system earlier to be the key sub elements for or organizational elements in a in a CE and; obviously, as before you know the theme of the membership theme integration. So, therefore, it means that higher the level of theme integration the better it is for the CE environment to be successful.

So, therefore, just as we split up into different levels a to d of the different influencing dimension of the product in the earlier lecture in the same manner we will do this between a to d again for the major sub elements of a CE environment just to get where the organization is among all these level Currently and where we want to take it ahead, in what are the or suppose I wanted to take it had what are the influencing some elements that we must change. So, that the organization goes to that particular level.

So, here for example, in the first category let us book and organizations where members have only task perspectives. Each member of the team has been given a well-defined task and they just carry out as per whatever has been given to them and do not look beyond that particular task.

So, they are very narrowly train in this kind of a situation let us just make this spaces for looking at the different elements ok. So, this is let us say a level A is the lowest level most expected level is that each member would have a well-defined task which probably either exists or maybe somewhere higher you know the organization is already placed.

So, then we have a level B were we talk about members who are having multi-disciplinary perspectives. So now, there is some kind of a cross training for example, person who is in you know let us assembly repair would like to do something like well repair on a vehicle because he has that multi-disciplinary training perspective which is

into picture and this just an example I mean it can go to any amount of you know exemplification about multi disciplinarily perspective. Then we talked about another level where members have really product perspectives.

So, here it does not matter what is the kind of engineering which is needed what is the kind of philosophy which is needed for developing or designing a product you will just concerned with what is there inside the product and then you have to have knowledge domain along all different walks of life which would be needed to realize such a product.

So, it is members with product perspectives and then of course, there are there is the highest category which is most reasonable for maintaining CE environment proper manner which is that members have strategic perspective not all the members are related to only what is going to happen you know in their own domain of work within an organization. But they do have an invasion meant about what are the strategies with an organization should use for being in business and how they can help it. So, that you know this knowledge based which comes out of such team membership category maybe share that some higher-level management level. So, that you know that the company can do well ok.

So, that is how team membership is categorized similarly if you look at team leadership we will have again you know a theme which is related to just the excuse me effectiveness of the team leader. And so, here we will talk about let us say in one case there is only a management appointed team leader. So, this is probably one of the simplest examples where there is a direct involvement in appointing a leader of a certain. You know let us a particular work domain by looking at the skill, set that various people would have trying to map them into the accurate most accurately into different teams ok.

So, here the affectivity maybe not so, high then we talked about again case B here which talks about management selected team facilitated. So, it is no longer appointed anymore. So, you have some kind of stake holding of people who are involved in you know the routine work of the team. So, there is some stake holding of those people also in this decision. So, therefore, you talk about management selected team facilitator ok.

So, we do not call it leader any more what we call it my capacity of a coordinator of facilitator who is just facilitating the teams job there is yet another category C; where we talked about giving the owners from the management to the team itself. So, this select

their own leader so, you have team selected facilitator and this may be one among the team member this may be on a rotation basis.

Depending on what is going to be the strategy and you know then there can be a category which is very dynamically assisted which talks about again a naturally emergent temporary. Though let us call this temporary most knowledgeable leader ok. So, then maybe certain area where work is envision where there may be a certain team player who is the most knowledgeable.

And so, in this kind of a category naturally that person who is most knowledgeable in that particular area images to be the team leader. So, it is constituting a dynamic team leadership which is probably going to be the reason for the concurrent engineering approach, but again you know you have to look at where existing you are in terms of your capabilities of the organization and very hard carry forward .

Again, we talked about team member contribution. So, team Harris synergism for example, so we can talk about you know contributions just segment or discipline specific you know or functionality specific. So, let us say we just call category a here which is segmented contribution which is only related to your own work; which is not related to really what is going to happen to the overall product or system that is going to win the award-winning criteria.

So, that is one level the second level is of course, a sort of liberate system with interface tools and multi-disciplinary advisors. So, you still have now some synergism because you have some liberating because of some interfaces which are available between what is going on existing level to may be the overall creation of realization of the so, called design which would finally, be evolved or which would finally, evolve as the award winning criteria. So, we talk about interface tools and multidisciplinary advisors.

So, we were talking about the team member contributions. So, the level C of that could be something where we will talk about a cooperative approach with the unified data model central master database. So, let us let us look at this has something which is naturally evolving there. Of course, is underlying assumption by all the participating members that whatever we do should be somehow unified together?

So, that you know the overall thing goes maybe met so, but then it is sort of necessitated here it is all understood and liberation. Because of sort of a host interface here it is all necessitated in terms of you know maintaining records has to exactly whether it is a cooperative or not approach or not.

So, that is how we will account for level C level t again level D would be the probably the highest level here we should talk about collaborative approaches. So now not only your own contribution, but the others contribution also becomes very important. So, you can say it is a computer assisted cooperative product development cooperative product development process. So, that is how we are going to have level D in that particular instance on that how the team member contribution would be varied similarly for the key into relationships between business is the theme is participation.

So, there could be only a transaction-based business model where whatever you have bought and sold should be in terms of money or a contractual where you give a part of the contract like that you give a labor contract for those are those menial tasks which otherwise do not need a very high level of technical skill then there can be a level C.

Again, in business relationships which talks about a joint venture approach where there is a stake holder of participating people. And then there is a partnership where even you know there as to be highest stake holding meaning. Thereby, that if you know the line of business is affected somehow it also affects the collaborators you know who are who are into business or the partners. Then we can talk about the supplement or training and education where the theme was awareness.

So, that could be again one level of you know training which talks about only let us say you know team concepts or you can you know talk about just computer assisted instruction 2 individuals of a team you know which will clear doubts about sort of who is doing what within theme without really have to worry about who else is doing what and in what manner. So, then there can be a multidisciplinary approach where you not only care about your own job (Refer Time: 19:26) .So, that the multi disciplinarians introduced among the participants.

So, you do a computer-based training. So, you learn from the word domains of multiple teams ok. So, you have a better perspective and that of course, there is another level of training which talks about cooperative decision process this includes multimedia-based

training programs where you have some kind of an involvement. So, you have cooperative decision processes. So, supposing there is need that a decision needs to be taken by 2 departments together for a certain activity which is going to be there.

So, one must arrived at the decision after just really talking to each other face to face even through multimedia if need be. So, you can talk about this as a multimedia computer-based training then one can have the level D which is about again synergistic knowledge discovery. So, this is probably the highest-level training maybe such that you keep on discovering what new has happened? In terms of learning experiences of a large multi you know multi-disciplinary work activity.

So, this is actually this stimulation you know this is like an interactive based interactive stimulation. So, it will automatically change if process is down the line changes you know it automatically change the processes let us say upstream. So, that is how the training would be on level D.

Similarly, in when we talk about responsibility and authority we know that the theme is empowerment. So, there could be just member responsibilities and rewards in one strategy of management that maybe if there is certain responsibility that a member has was done it intelligently and there are certain incentive promotion schemes. We should be rewarding those members you have fulfilled the responsibility with authority. So, that sort of an individual stick model.

So, we call this on level A level B could be something like a multidisciplinary group responsibility ok. So, like for example, you have a lot of this quality circles where there are different people participating. Together for making or studying and quality problem which is of multidimensional kind. So, you need multidisciplinary training for example, in that kind of situation.

So, in level B we have responsibility which is also and also rewards related to this multi-disciplinaryness among different themes then that could be still a level C which talks about you know what decision-making responsibility of a particular team. So, team decision based. So, the responsibility and authority of deciding something rests on that of the whole teams mind to take a decision.

So, that is again sort of one level of responsibility and authority and then you have the most the ultimate level of responsibility when we talk about team autonomy that individually whatever is decided is accepted at the single team level and then there are certain autonomy features which are there all through for example, you know for management of activities related to daily requirements there can be a higher level of autonomy given. So, that the team can autonomously decide something and go ahead with it.

When we talked about management decisions again there can be perspective based classification for example, all decisions in category A and B mostly profit based or let us say even planning can be just based on the products unit cost accounting models planning based on product unit cost something like that. You already saw this kind of management decisions, when we talked about the less example; earlier in the concurrent engineering activity. There can be get another level D in the management decision; where we talked about single phase planning on investments using design to cost accounting with risk management.

So, there is certain amount of risk which team can take management team can take for a certain decision. So, you have a single phase planning and you also have a empowerment to invest using calculated risks then there can be another yet another management decision making level which talks about multiphase planning and this can be using value based decision support systems where you know there is no more cost accounting based or something is physically based on general experience about our decision will changed the scenario.

And so, plans at all levels as far as management decisions are concerned are based on investment using value based decision support system ok. And then it can be another level D in the management decisions which talks about mostly you know the life cycle-based decision making. So, this is actually very, very broad overview decision which arrives at based on different aspects of the product and different times ok.

So, typically that is what the final goal of all content engineering environment are that how you can actually integrate yourself to the product life cycle. So, these are how organizational elements are classified similarly we will have you know some other

elements here. For example, the second most important element is related to the individual requirements ok. So, we call case b here requirements.

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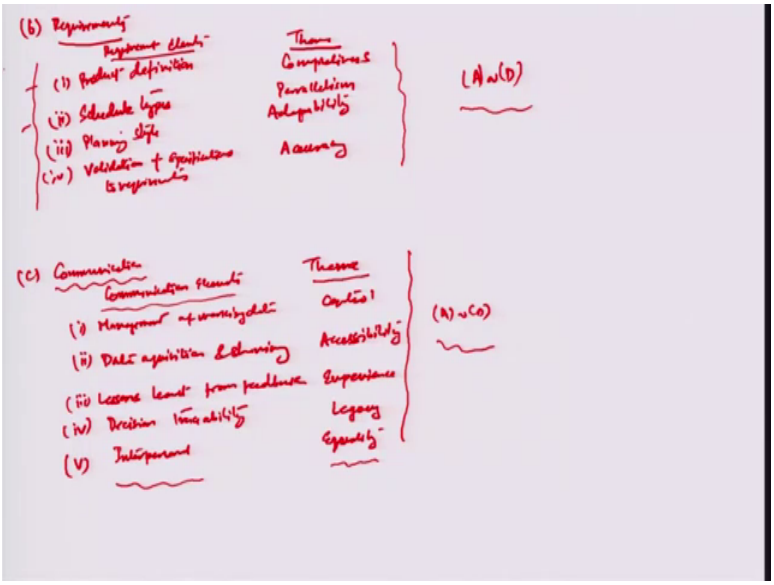

So, requirements would have various components various sub elements like for example, there could be product definition which is again, a major element in the requirements related to the setup of an approach concurrent engineering approach. So, let us classified these as requirement elements and then each of them would have a theme. So, this is for a definition is based on the central theme completeness ok.

So, how close you are to the actual product design? We should be eventually implemented could be a definition a product definition-based requirement element. Similarly, there could be requirement based on schedule types for example, there could be parallelism in reproach when we talk about scheduling ok.

So, multiple things can start and stop at same time when they are not integrated to one another. So, that way that could be time saving overall there could be again requirements given by planning style healthy theme could be something like adaptability, that how planning changes as one proceeds in time in our adaptable planning process could be.

So, that you know there is always a substance of this concurrent engineering approach and then finally, there could be validation of specifications to requirements which can be

based around the on the central theme of how accurately you are mapping the specifications which would be another requirement element.

So, the product definition really refers to the process of capturing and translating the customer demands into this specification of the product and process features. And this is just because you want to at end of the day, satisfy the lifecycle needs including manufacturability, supportability, upgradability, human disposability, these different aspects related to the product.

And mostly for this kind of requirements for planning of requirement elements used various tools like, one of the most commonly used tools is also known as the quality function deployment, which I will be teaching in where details after this particular topic is over or this particular case study is over. So, what the cost model says is that you know you can plan the various requirements in terms of some elements namely these 4- definition schedule style stunning styles validation of specifications to requirement based around certain themes just as you did in the case of organizational elements ok.

So, you doing some things related to the other products and schedules and the planning needed similarly you will have you know another aspect of the elements needed for the major elements needed for the concurrent engineering environment setup which is about communication.

So, you have already in compass to the organization aspects on the requirement that given to this organization know how to communicate is also one of the key elements of this concurrent engineering. It means, you know your providing either horizontal communication among all functional areas which include design which include manufacturing. Let us say, support you know with to the customers as well as supply various stages of let us say the product life cycle see the objective here, is to optimize what you are designing and the decisions that you are taking in terms of designs.

Just because you want to improve the product development process in manufacturing of the product and also the getting of support service the people who are uses for the particular product for communication needs to be very, very effective. So, if I wanted to list different sub elements responsible for these communications to maintain a concurrent engineering-based atmosphere.

So, you have the following communication elements based around the following things which would be considered in this particular case for finding out the different communication needs of such a concurrent engineering and atmosphere. So, one of them could be for example, the management of working data. The theme of this could be of control that what level of control need to be exercised by the management to the accessibility related to the management of the working data. Similarly, there can be another important element here which is about data acquisition and sharing which again can we based along the central theme of accessibility.

So, how accessible you are making? The particular data and how you know accessible is your acquired data. Also who comes into maps into the communication elements associated with the concurrent engineering network? Then you can also think of what are the lessons learnt from feedback.

So, this to be based around the central theme of experience so; obviously, if more experiential learning is embedded into a concurrent engineering environment the decision making is going to much faster and a appropriate. So, the reasons for all this communication-based requirements are in principle the fact that these objectives to optimize design decisions really depends on broadly on the communication process ok. So, it is it is very important to sort of you can say the hierarchical various which are created within an organization at to exchange information in a timely and accurate manner.

So, that over all there is a satisfaction of the dynamism that exits with an organization for satisfying some predatory requirement etcetera. There can also be other communication elements except from how you manage the working data or how you acquire and share the data. How you are learning from feedback the 4th more major communication element could be something related to decision traceability.

So, there you know you can basically talked about legacy issues for example, who was responsible for a certain decision at a point of time, because of which some particular environment has been created related to the CE environment ok. And then you can also talk about interpersonal communications as another element which talks about mostly quality that what is that you need to know and how equality is in terms of you know or

how equal it maps in terms of any other person within the same organization? Which can actually; set these communication elements for CE environment.

So, just as we did a degradation of the past 2 requirements. Namely, the organizational aspects as well as even though you know the influencing dimensions into A to D category. We can actually have categories to again organize this requirement elements and communication elements of CE environment in terms of various levels at which they can be placed. And so, once this whole hierarchy of phase 2 is being developed with phase 1 you would like to map, where we are in terms of the influencing dimensions and phase 2.

Again, where we are in terms of the various elements that constitutes the existing concurrent engineering economy and then we can take of course, the decision that where we would need to go to help ourselves get into shape, for the to be concurrent engineering environment. I am going to know before going ahead share with you and other important in a requirement on another important element for concurrent engineering environment which is about product development methodology.

Following which we will look into some of these tabular means of representation into various levels of the requirement communication. And the 3rd product development methodology and then we will go into the final analysis phase will take a case study and try to talk about the exact map of where the organization is given some conditions and where we want to take it ahead. So, this particular module, I would like to end now. And in the next module I would like to go ahead with the next part of phase 2 which is about the product development methodology. So, thank you very much for attending this lecture.

Thank you.