Six Sigma
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Lecture – 13
Management and Planning Tools Part – 2

Hello friends, I welcome you to lecture 13 Management and Planning Tools Part 2 of our lecture series on Six Sigma. We have already discussed couple of tools as a part of lecture 12, Management and Planning part 1 and in continuation do these we will see few more tools which are extremely important in analyzing the situation based on the group thinking, based on the brainstorming, consensus and finding out the root causes of the problem or looking for the better alternatives.

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So, if you just see a little recap then we have appreciated brainstorming, affinity diagram as the important tools in generating new ideas, creativity needs to be applied and biases should be minimized, too much early judgmental decision hampers this processand if it is done in a systematic way then the brainstorming leads to affinity diagram which is a very useful and important outcome for the organization.

Then we have see we have seen tree diagram that how we can explore the level 0, level 1, level 2, level 3 related details and we can also set the traceability for reaching to the root cause and the final outcome. So, that was the tree diagram, then we have seen PDPC

diagram. So, here we are not only concerned about the various problems and the reasons for the problems, we do conduct the what-if analysis and we try to develop the contingency plans. So, if this problem arises then what could be the option A, B and C, I can execute.

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Now, in this particular lecture 13, we would like to see few more tools widely used also known as new management tools, matrix diagram, prioritization matrices, activity network diagram, Gantt chart, force field diagram, benchmarking and PACE prioritization matrix. So, let us see each one, say in detail and also let us try to appreciate it is application.

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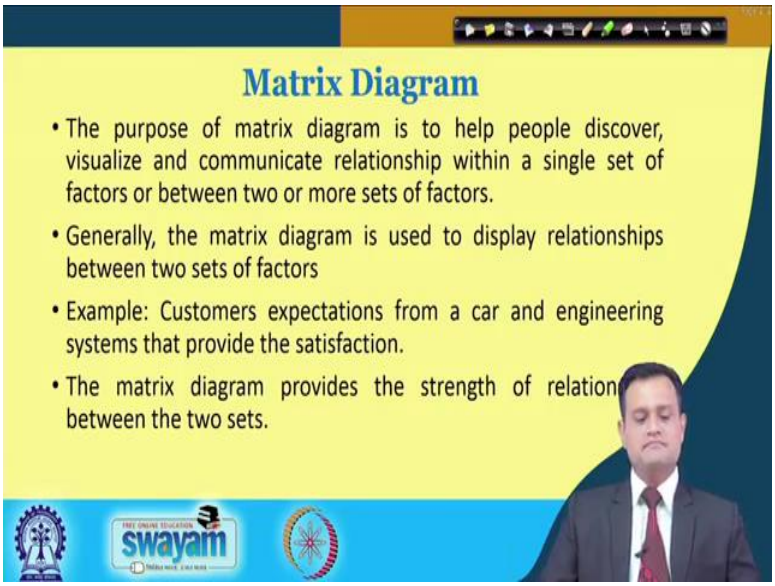

So, typically matrix diagram as the name suggest it basically represents the data in a matrix form to help people discover, visualize and communicate relationship within a single set of factors or between two or more set of factors.

So, generally the matrix diagram is used to display relationship between two set of factors that is the general practice and suppose if we see the example then we have customer expectations from a car and engineering system that provides the satisfaction. So, to what extent these two are really matching? If you recall more or less similar kind of thing we did in QFD, we in fact created the roof matrix, correlation matrix, we have also related whats and hows and we constructed the HoQ, house of quality.

So, matrix diagram provides the strength of relationship between the two sets and this is where say we can really become more critical about the association, relationship among the factors and variables.

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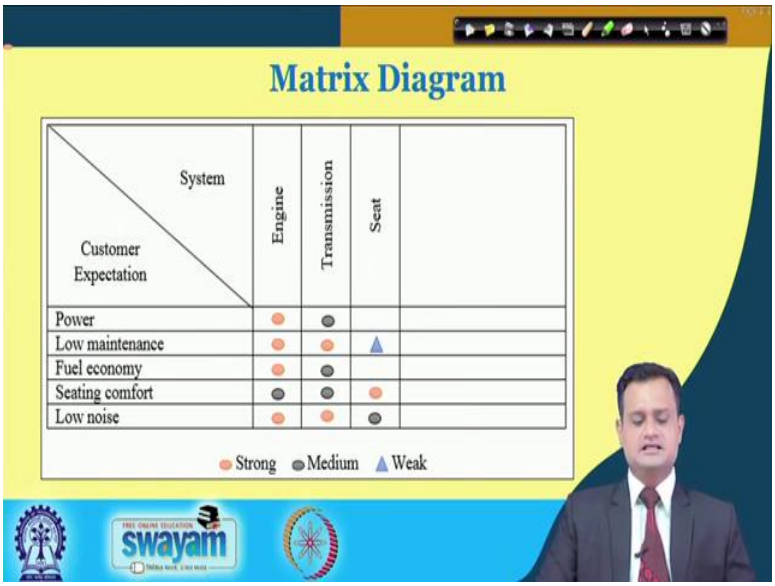

Just see that, let us say system is engine for a car, transmission sets and on the other side. I have customer requirements in QFD typically we call it as whats. Then power, low maintenance, fuel economy, seating comfort, low noise and I have selected 3 symbols let us say orange is strong, grey is medium and you can see black say blue triangle that is weak. You can choose your own symbol and maybe you can expand this from 3 to 5. So, I just depicted based on the discussion, interaction and the impact of a particular technical parameters, system parameter on the customer expectation and depicted the relationship, identified the relationship between two variables.

So, when you can really set such kind of relationship then that helps you to be more cautious at the design stage and hence your design team would be more careful about the strong and medium relationships.

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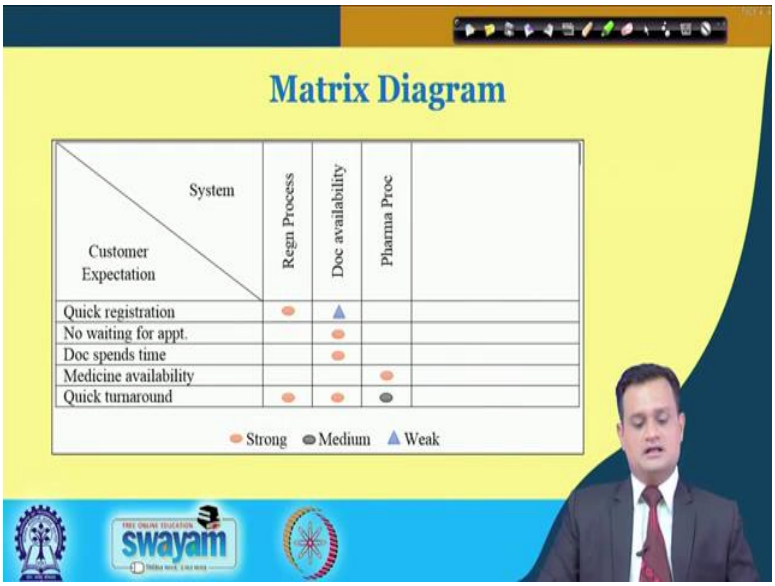

We can further continue that regn process, doc availability, then you have pharma procedure another example and you have customer expectation, quick registration, they do not want to wait, no waiting for appointment, health care system, doctors spends time they do not hurry and medicines are available, quick turnaround and there is a relationship between variable and you can see that quick registration and registration process these two are strongly related. So, what are the layers? How many layers? How many people you really have to cross to complete your registration process that decides your quickness in the registration?

Then doc means document availability. So, there is a big relationship, but if you see no waiting for appointment there is a strong relationship. Similarly, if you have the data information available, then doctor spends time whether the doctor will spend quality time, more time or less time it depends upon the information available and similar way you can try to see that availability of the medicine and pharma procedure these two have a strong link and likewise we can design the system which can respect the strong link factors variables and does not say allow the customer to go through the process of pain.

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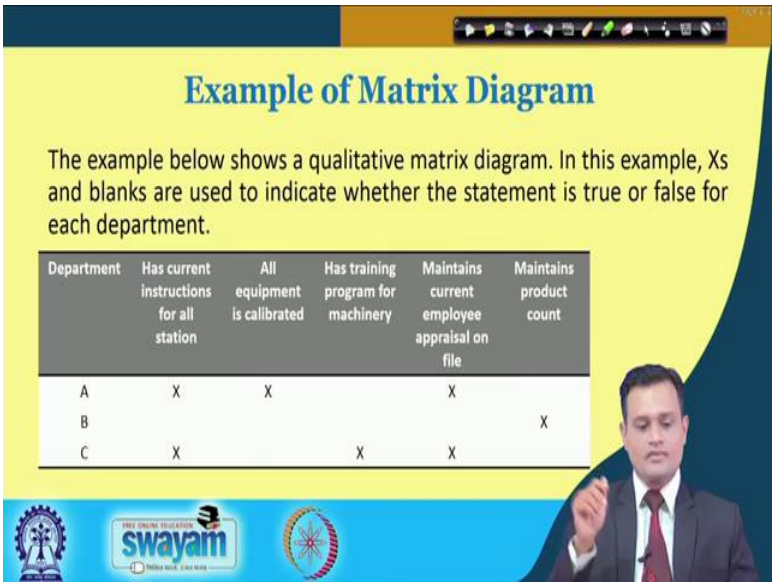

We can see further the example here shows a qualitative matrix diagram and in this example say X and blanks are used to indicate whether the statement is true or false for each department. So, here say, in the 1st column I have put department A B C and then you can see has current instruction for all station all equipment is calibrated, then you have has training program for machinery maintains current employee appraisal in file.

So, typically this particular example you have say departments versus the different criteria for their audit or evaluation and maintains product count. So, you can just relate and simply check that ok what is the score of a particular department on set of criteria?

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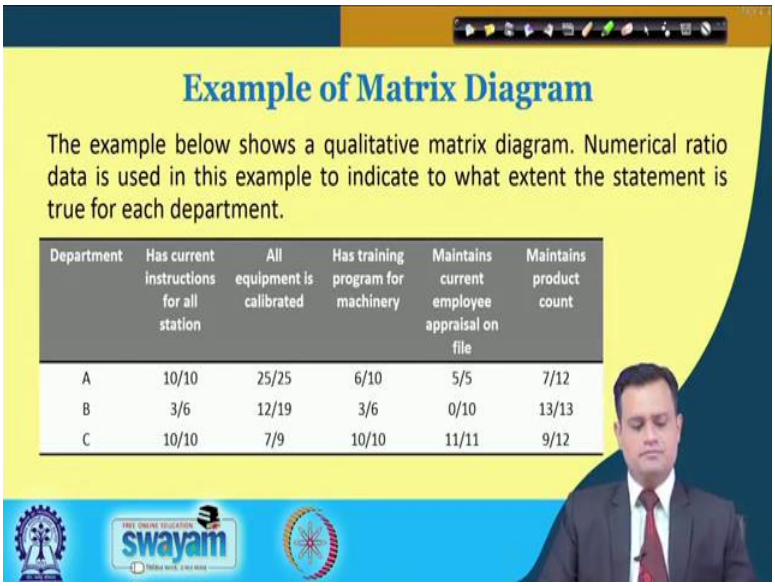

So, there could be many examples we can share and we can put our matrix into different form either simply by symbol or by number. In this example, I have use the numerical ratio to depict or for example to indicate what extend the statement is true for each department.

So, I would say that department A has current instruction for all station the same previous table is replicated, but here I have used the numerical ratio. So, I would say 10 out of 10, it is something like getting the marks out of something all equipment is calibrated 25 out of 25 has training program for machinery. So, here I am not just trying to say yes or no, but here I am trying to be more elaborate that to what extent particular activities perform.

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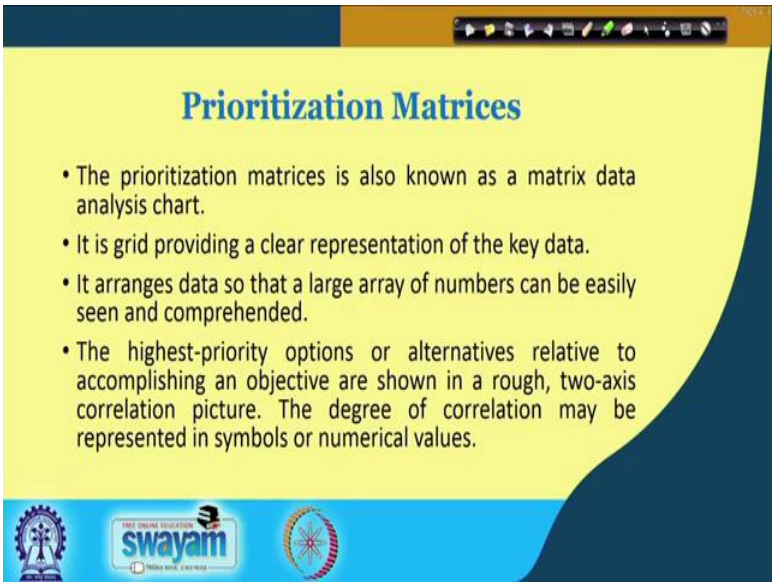

The extension maybe we can see as prioritization matrices. So, these matrices are known as matrix data analyst chart. So, they themselves act as the analyst and this chart helps you do deeper your insights into the present situation. So, this grid provides a clear representation of the key data and it arranges the date so that large array of numbers can be easily seen and comprehended. So, highest priority options or alternatives, relative to accompanying and objective they are shown in rough, two access correction picture and the degree of correlation may be represented in terms of symbol as we have seen or the numerical value.

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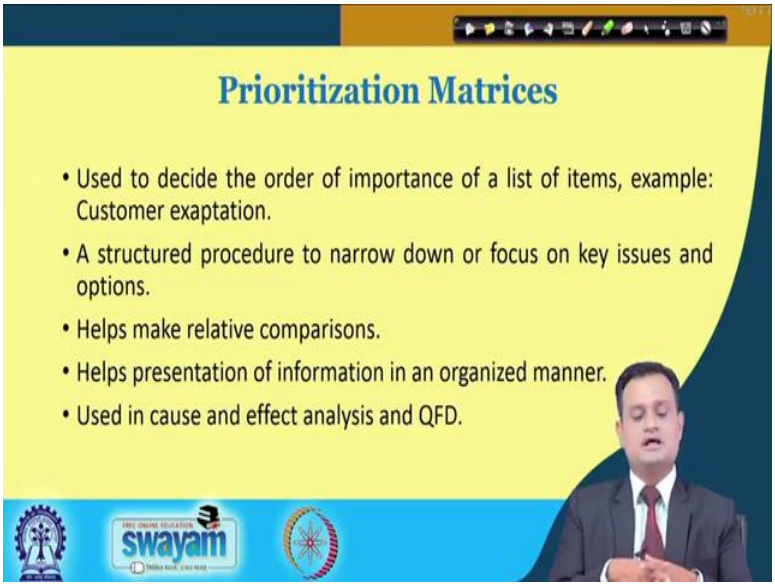

So, we have done such kind of analysis, adapted such kind of system when we did the cause and effect analysis for QFD and typically this structured approach procedure helps to narrow down or focus on key issues and options.

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So, typically I can say that a prioritization matrix can be used, to study the strength of interrelationship between things and you can recall QFD say top roof that triangle roof where technical requirements and their strengths were evaluated. So, such as two or more process or product characteristic or different product in market characteristic can be correlated. So, it is a technique gaining increasing use in industrial sector.

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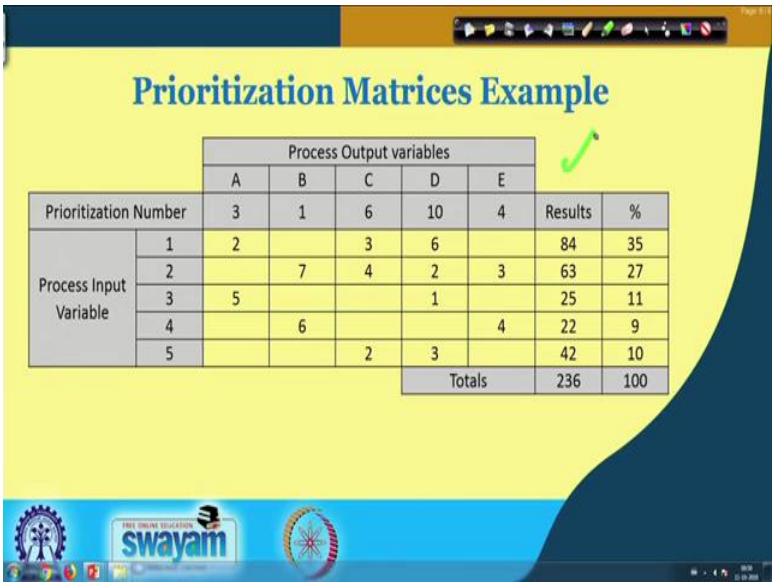

So, let us just see the example of prioritization matrices, you will find in the first column process input variable and this is prioritization number indicated for each particular process output variable A, B, C, D and E. So, I will say that process input variable are 1, 2, 3, 4, 5. You can see this here this is 1, 2, 3, 4, 5 and we have process output variables basically say these are A, B, C, D, E are the process output variables. I have assigned some prioritization, I have assigned some prioritization number to each of the process output variable depending upon their severity and importance and 3, 1, 6, 10, 4 is assigned to A, B, C, D and E respectively.

Now, what I am doing here? I am trying to figure out the relationship between two factors variables, here two factors are input variable and the output variables and I will say that fine I have a relationship of the order of 2 or that much strength here I have relationship of 7, have relationship of 4. So, you can choose your scale to define the strength of the relationship and then you can assign this number based on the consensus based on the expert opinion and discussion.

Now, I am interested in finding the results. So, this column I am just deriving with a very simple calculation. I will say for example input variable 1, now for input variable 1, I have priority number 3 and it is rank is 2. Here there is nothing in the call this particular cell for C it is 6, 3, for D it is 10, 6 and here there is nothing. So, I will just multiply 3

into 2, 6 plus 6 into 3, 18 plus 10 into 6 that is 60 so, this will give me the number that is 84.

So, likewise I can do the calculation for all the process input variable and what you can see here that result I am getting 84 as the score or result for input variable 1, input variable 2; 63, 25, 22, 42 and so on so, my total is 236 and I can find the percentage so, my 1st process input variable is receiving let us say 35 percent, 2nd one is receiving 27 percent, 11 percent, 9 percent and 10 percent. So, you can see it is a very simple tool, but such a fantastic information I can reveal and based on that I can understand the importance of my input variables.

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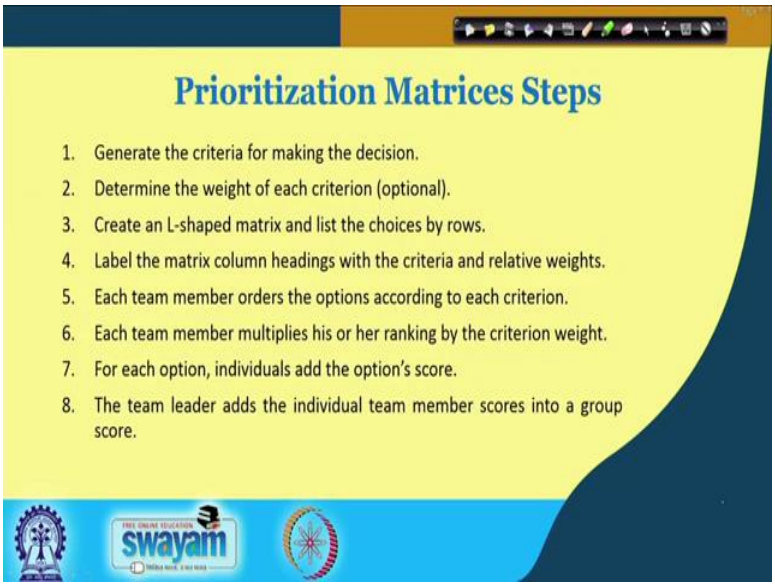

So, prioritization matrices steps are very simple to follow. Number 1, generate the criteria for making the decision. Number 2, determine the weight of each criteria this is optional you can even assign the equal weight and if you feel that no there has to be different weight based on the consensus expert opinion you try to designate this weights. Number 3, create an L-shaped matrix and list the choices by rows. Number 4, label the matrix column headings with the criterion relative weights. Number 5, each team member orders the opinion according to each criterion. Number 6, each team member multiplies his or her ranking by the criteria weight and 7 for each option individual at the option score and 8, the team leader adds the individual team members score into a group score.

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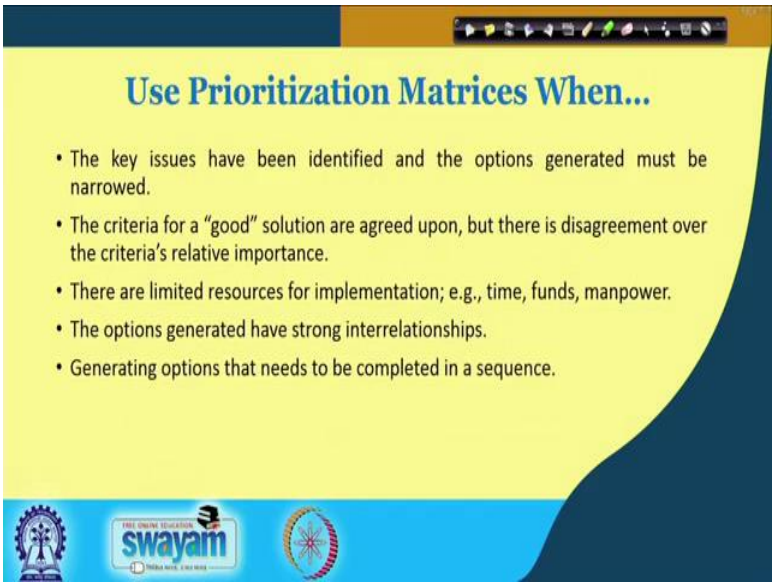

So, we use typically this kind of matrix or prioritization approach when the key issues have been identified and the options generated must be narrowed down. So, you have done the brainstorming, NGT, multivoting and various techniques you have used in order to generate the ideas. Now obviously, you cannot work on all the ideas or projects, you have to narrow down your list and this kind of approach can really help you to derive the consensus based on a team work on the set of criteria, and then you can allocate the necessary resources, budget to those projects which are really receiving the higher importance.

So, the criteria for the good solutions are agreed upon and then you can work on it based on it is relative importance.

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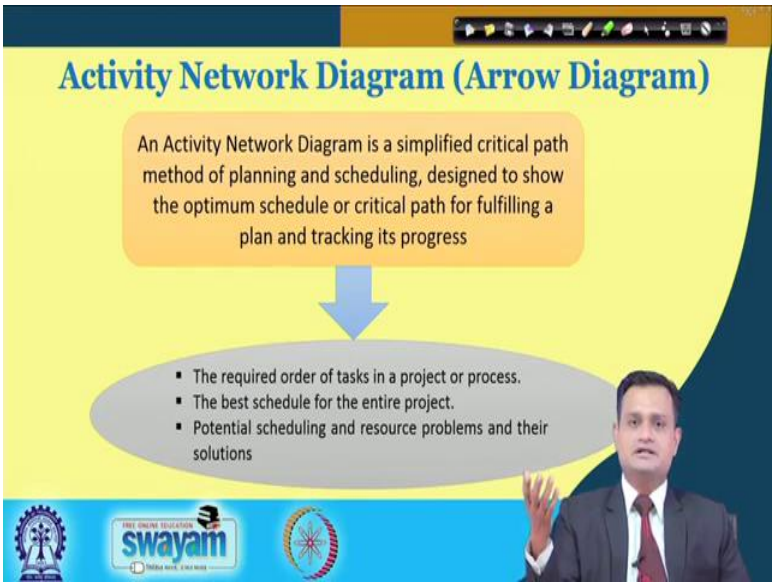

The 3rd, in this particular lecture the third technique which we would like to discuss is activity network diagram and arrow diagram. So, I hope you have some knowledge on project management and typically this diagram is widely used in project management to depict the interrelationship among the various activities and through this you can very well understand the predecessor and successor relationship. So, typically an activity network diagram also called AND, is a simplified critical path method of planning and scheduling design to show the optimal schedule or critical path for fulfilling a plan and tracking it is progress.

So, here if you are new to project management, then you need to appreciate the critical path when we want to schedule a project, typically project comprises set of activities represented in the form of a network interrelationship and we know that each activity consumes resources in terms of time and manpower. So, this network which depicts the successor, predecessor relationship will have many paths to reach from initial node we typically call it as a source node to sink node and the longest path taking the maximum time we would call that as the critical path. So, my critical path will decide the project completion time and we go for the critical path analysis because we want to apply the selective control in managing the project.

So, here again the Pareto laws applies, I cannot manage or I cannot monitor and control all the activities equally, but if I have some idea and if there are 1000 activities in the

project and suppose my critical path contains 100 activities then I would be able to apply better control over this 100 activities which has direct impact on the project completion time. So, this is what we do and in order to do so, we usually make use of forward and backward pass scheduling procedure, computation, linear programming approach is also widely used and for a small network you can enumerate the paths and figure out that which one is the maximum time consuming path longest path which is the critical path. So, for that you need input and this input is nothing, but your network diagram, activity network diagram.

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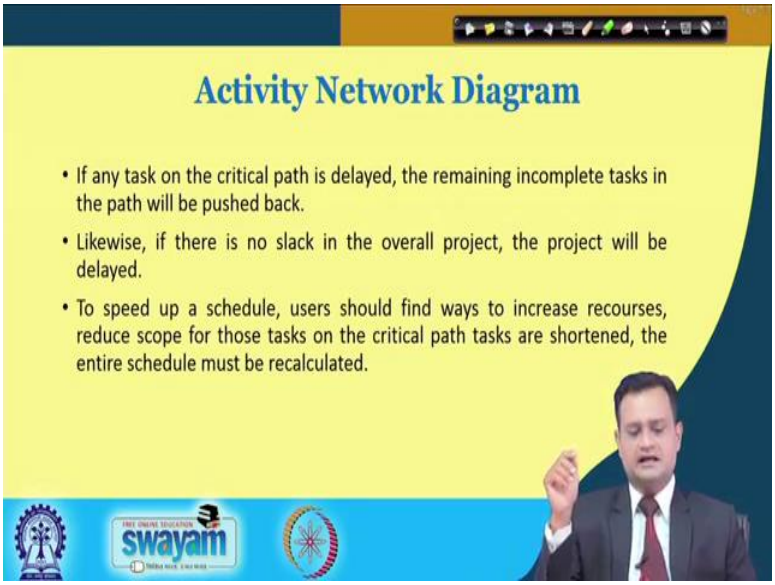

So, typically this is what I just said that we figure out the critical path and try to apply the selective control.

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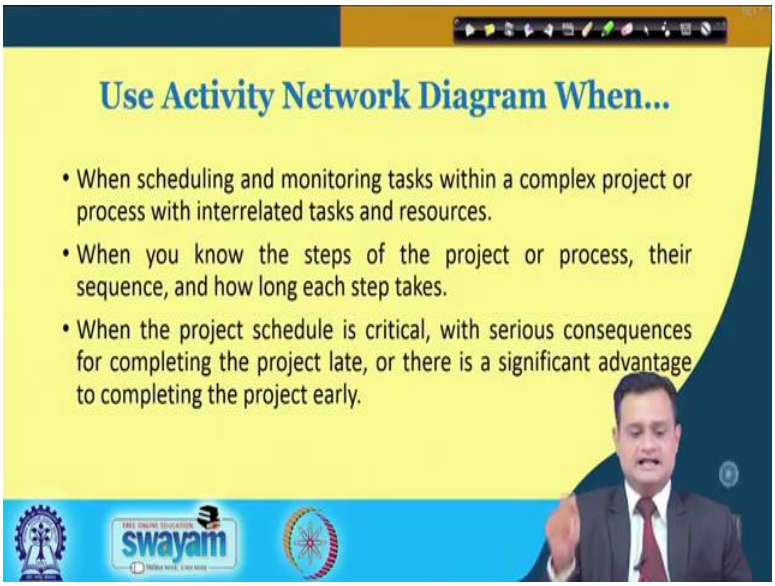

So, we use AND when we have to schedule the project and subsequently apply resource allocation, time cost trade off, as well as earned value analysis kind of approaches. So, these are the various concepts usually we refer in the project management.

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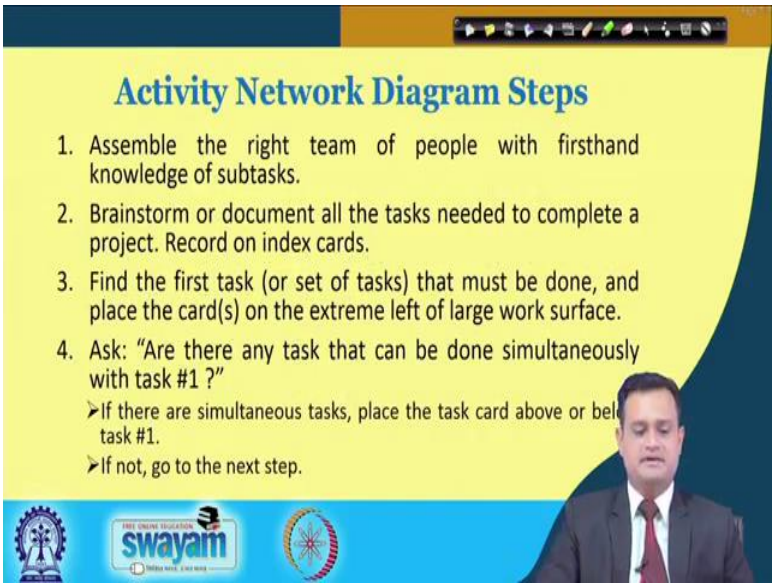

So, the steps are very simple, assemble the right team of people with 1st train knowledge of the subtask because this is where your past experience knowledge is very much required to decide about the activities and their nature as well as their description.

Brainstorm or document all the task needed to complete a project, record on index card. Find the 1st task set of task that must be done and place the card on the extreme left as I said you will have source and sink. So, extreme left and of the large work surface. Subsequently keep asking are there any task that can be done simultaneously with task 1. So, basically you are trying to figure out predecessor successor relationship and you keep on going till you reach to the final node final task that is called the sink node.

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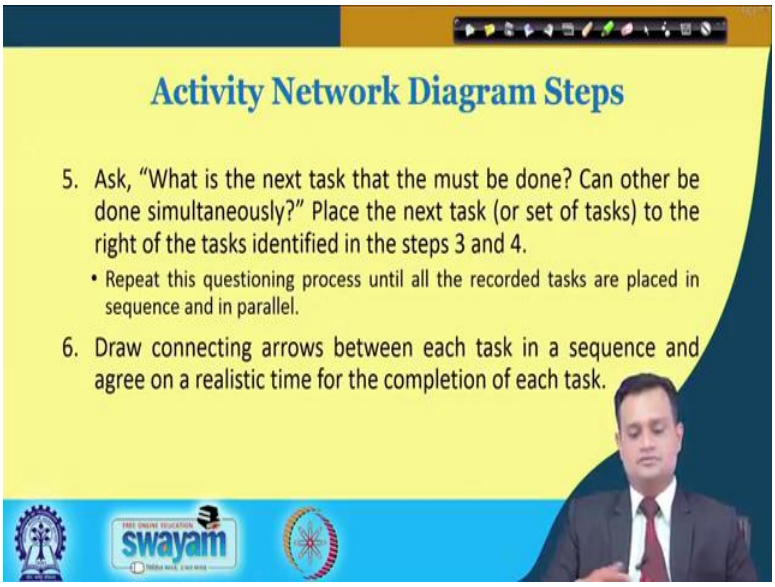

So, this you keep repeating and then you try to figure out what is the last node.

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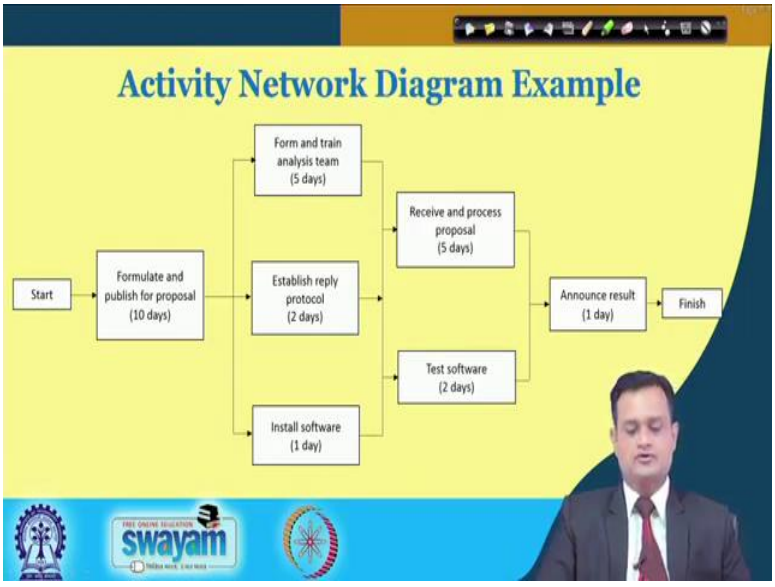

So, just see the example that start is the beginning node formulate and publish for proposal you will take 10 days, fine. After that once this activities is done you will have form in train analysis team this task will consume 5 days, then establish reply protocol, 2 days install software subsequently. Once this 3 cards which are parallel are completed you can proceed for receive and process proposal 5 days and test software and finally, you have the announcement of the results and finish.

So, this will give you a systematic pathway with the milestone to see that how your project will proceed and in what way you should respect the predecessor successor relationship in order to complete your project within the stipulated period of time.

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Now, there is another important tool which is also widely used in the project management and I need not to remind you that six sigma is a typical project you have multiple six sigma projects in your company and for each project you need to have activity network diagram, Gantt chart and this kind of tool to closely monitor the progress of your six sigma project.

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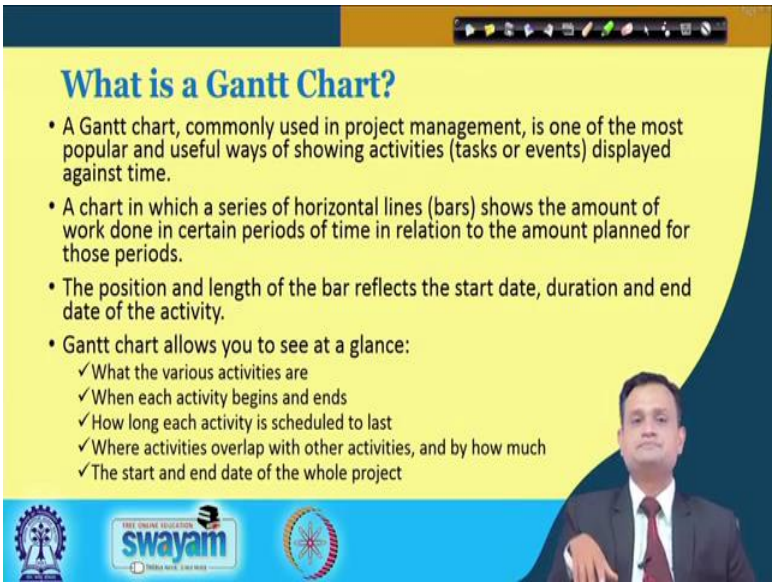

So, Gantt chart typically this particular tool is commonly used in project management, and it is purpose is to show the horizontal lines or bars with amount of work done in certain period of time in relation to the amount plan for those periods. So, you can keep a close check that what is the amount of work I have basically planned and against that how much work I could complete. So, the position and in the length of the bar reflects the start date, duration, end date of the activity and you can see that enormous information you can collect from the Gantt chart that what are the activities are 1st thing, 2nd when each activity begins and end, how long each activity is scheduled to last and likewise we can reveal many information for our better planning monitoring and control.

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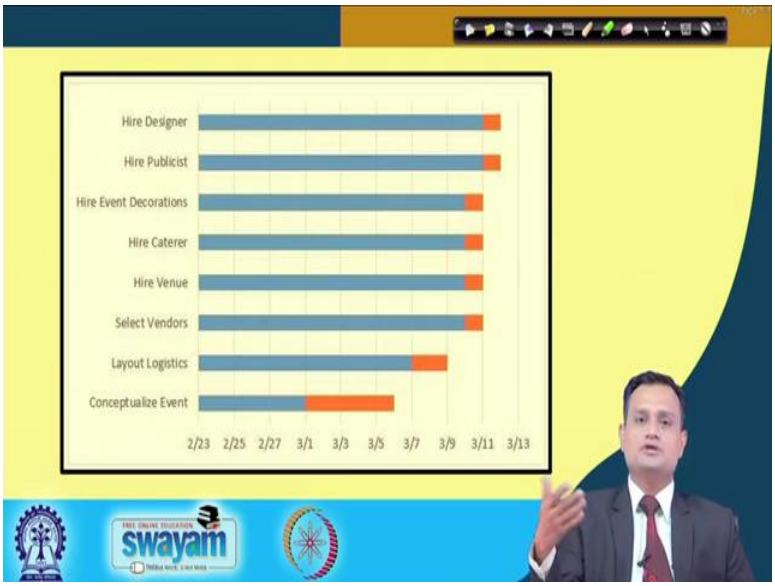

Just see the example for your better understanding. Here I want to organize let us say a conference or maybe you can say the event like marriage ceremony and whatever. So, I have conceptualization of the event, layout logistics, select vendors, hire venue, hire caterer, hire event decoration, publicist and then designer.

So, you have set of activities to perform each activity will begin at a particular point in time and then it should finish by some time. So, here you can say 23, 2. So, it is 23rd February, then 25, 2 that is 25th February so on, and I am planning from February to March for maybe 1 month and I have extended the bars to see that how each particular activity will be executed.

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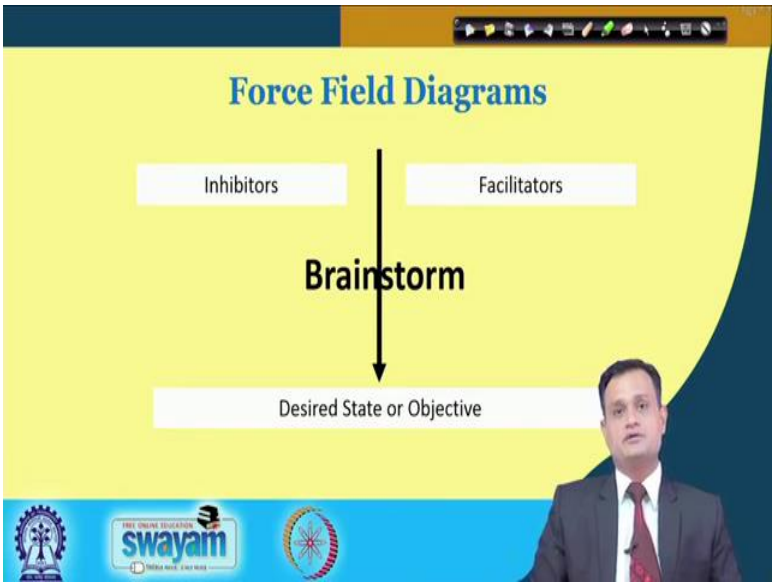

Force field diagram, you can see that I am doing the brainstorming and as an outcome if you systematically say jot down your ideas or jot down the opinion of the experts you will find that they may be categorized into two broad categories, one is facilitators other is inhibitors.

So, I want to reach to a desired state or objective and there are opposite forces which are restricting me, enabling me to realize that particular objective. So, now, if you really represent this facilitating and or enabling and inhibitoring hindering forces then you can better device the contingency plan or you can find the net force exerting on your system and understand the overall inertia in executing a particular project.

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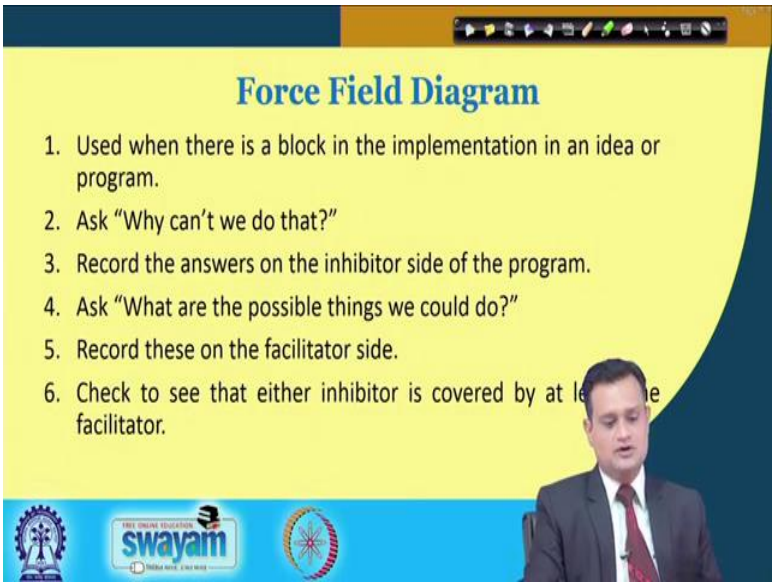

So, now just see that as I mentioned used when there is a block in the implementation in an idea or program. Ask why cannot we do that? Why cannot we reach there? What is endroying us? And same way what are the possible factors that can enable us and just try to jot down.

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Let us see the example that will make the picture better clear. So, here we have written a paper in 2006 and this is the paper where we evaluated the total quality management

implementation issue in education and force field analysis was used, also QFD was used as the tool for analysis.

So, here you can see that there are negative forces that resist the change, there are positive forces that supports the change and you will see if I read out couple of them then force one functional autonomy for self finance colleges. This is enabling, they can decide their own curriculum, exam pattern and other thing.

Force 3, increasing competition between academic institutions and the quality expectations goes high. Force 6, opportunity to benchmark, if you see couple of negative forces then management pressure for giving better result, sometimes they are forced compelled to dilute their quality. Force 4, let us say poor qualities of the students it is extremely difficult to process if you are raw material is poor and here in this system it is the student. Force 7, lack of training and improvement programs and your teachers, your staff, administrative system are not geared up to excel in the competitive dimension. So, this is the example of force field analysis.

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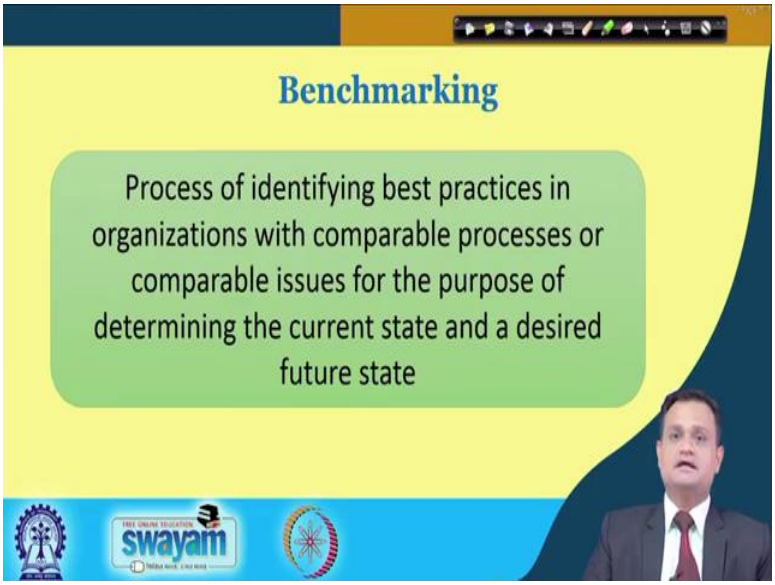

The another important tool I would say extremely important tool and we are appreciated the use of this tool in quality function deployment this is called benchmarking. So, here I have written some definition, but in my own words I would say benchmarking is the process where I feel humble to accept that yes, something or somebody is better than me and comparing my performance, my practices with that standard will definitely help me

to put my efforts and initiatives for improvement in the right direction. So, it is a process of identifying best practices in organization with comparable processes or sometimes comparable issues for the purpose of determining the current state and the desire feature state typically a gap and set the action plan for improvement in that particular direction.

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So, as I mentioned that benchmarking has lot of advantages. It puts you on the path of improvement in a directional manner. It gives you enthusiasm and motivation, to achieve certain standards, which are competitive need of today and it typically serves as a continuous improvement process.

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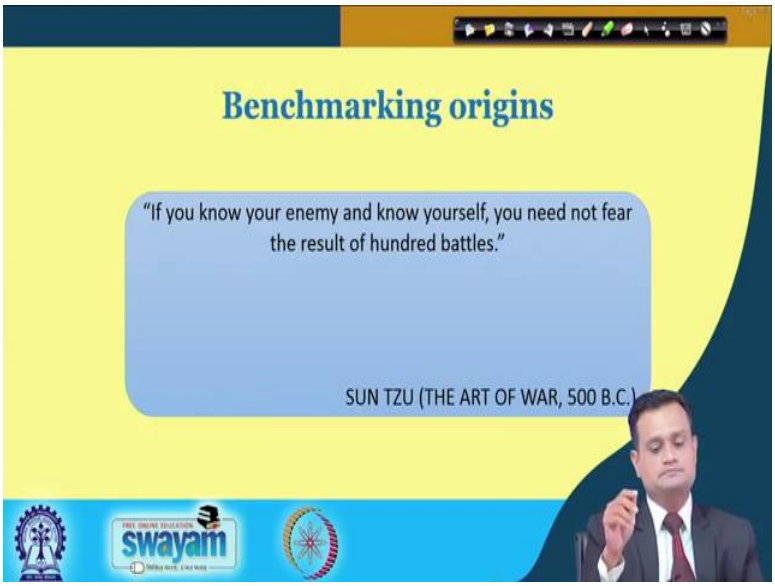

So, there is a very good saying that if you know your enemy and know yourself you need not fear the result of 100 battles, ok. So, if you have this SWOT analysis, if you have this gap analysis, fantastic.

Some times as a faculty advisors student they come to us and let us say their result has gone down and some student has scored only 5 SGPA, Semester Grade Point, then he will ask sir what should I do. I will just give a very simple advice. Fine, do you have a friend? Yes, he will say. What is his score? He will say 8.5. You just start following whatever he is doing, so there is a gap and you got this result not because of less intellect you all when you entered into IIT are equal, but there is some difference in following the practices and if you can adopt the right practices you will definitely improve upon your say grade point.

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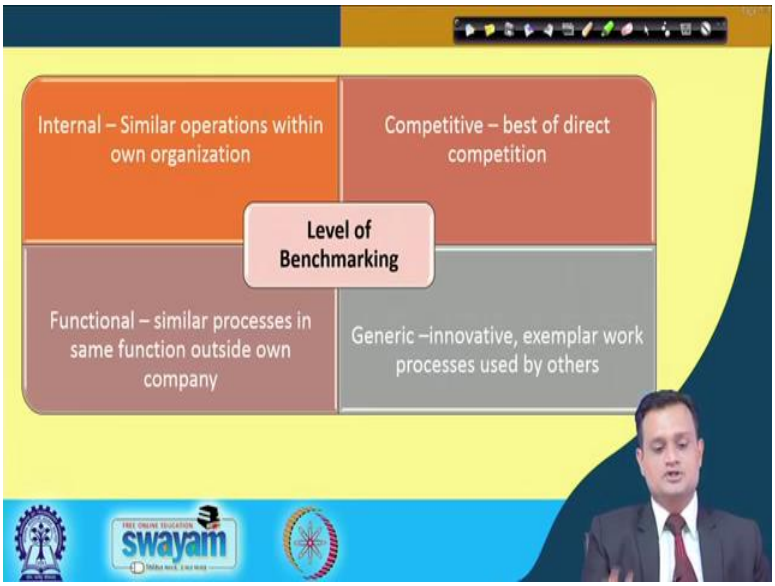

So, here there is something interesting to observe that many a times we see and I gave the example that if you are 5 pointer student look at the 8 pointer student and improve, but this is one kind of benchmarking. We have lot of variety.

Just see level of benchmarking you can see this particular say quadrants and this quadrant says that you can have internal benchmarking similar operations within our organization. Now, you have various units operating at different location or subsidiaries, you will find that some units of subsidiaries are performing fantastic they have five sigma, six sigma and some units of subsidiaries they are performing at three sigma. This calls for internal benchmarking adopting the best practices from our own people within the company and typically this is your internal benchmarking.

Now, let us look at the other one. This is your competitive best of direct competition. Suppose I am manufacturing bearing fine, let me look at escafe, let me look at the others. I am manufacturing tyres, let me look at Apollo, let me look at MRF and try to see that what are the technical features that they try to build-in and how do they manage their competitive standing in terms of price and quality. So, this is my best of direct competition.

Now, let us see the 3rd one, this is the third one functional similar processes in same function outside own company. So, here I am not talking about the particular competitor. Here I am talking about a particular function and this function maybe in the other

company you can visit and benchmark. Then we can see the last and 4th say quadrant that is generic innovative exemplar work processes used by others.

So, here suppose you are visiting a bank and you are getting an excellent experience that fine there was no queue, the climate was, the atmosphere was quite cordial, the behavior was very much welcoming, I could not wait, I need not to wait and my application was processed within no time. So, this is generic, and do not you think this can even be applied to hospital and restaurant and another service sector. So, this is the fourth where generic-innovative exemplar work, we can compare try to get the inspiration and then we can replicate it, implement it to other domain.

So, now, let us go ahead with some more understanding in this part 2 lecture.

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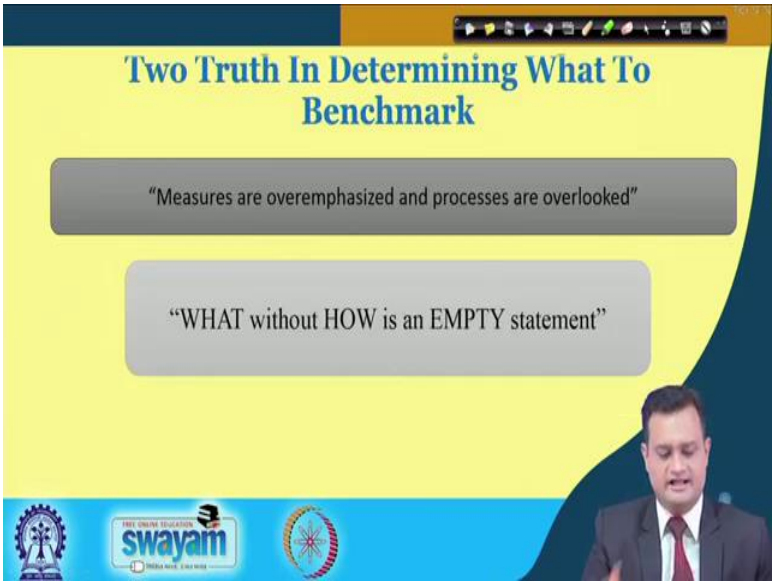

So, two truth in determining what to benchmark. Number 1, measures are over emphasized and processes are overlooked. Maybe because of ego, maybe because of too much local focus, maybe because of my past experience and biased approach, but remember it is a journey of continuous improvement and we must do the gap analysis time to time.

WHAT without HOW is an EMPTY statement so, fine you may figure out what what, but how to do, how to reach there, how to achieve the standard which my competitor as set, then you have to do the benchmark.

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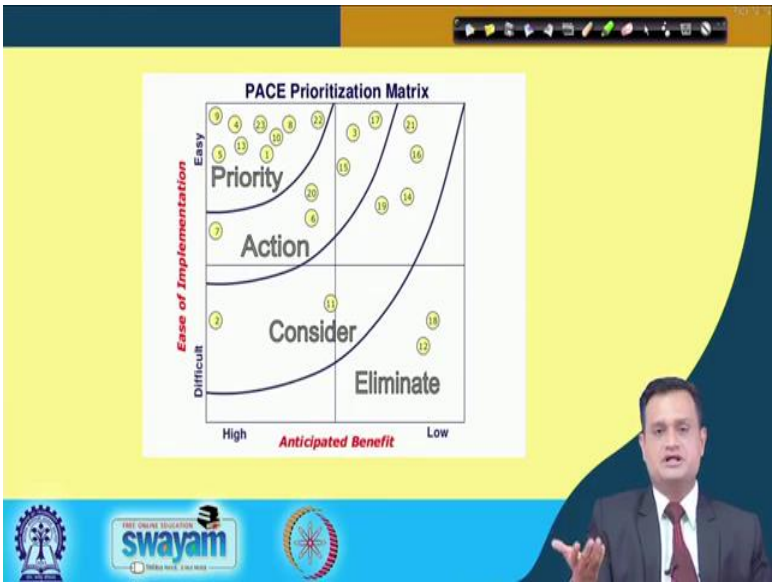

So, finally, the last approach is space prioritization matrix. It is a very much fantastic and useful approach which depends over understanding much more then what we have seen in the other approaches.

So, just see that what is being done here. I have anticipated benefit from high to low on x axis, and there is ease of implementation on y axis difficult to easy and I just try to put my opinions, I try to put the alternatives, suggestions of the people on this matrix and in this 4 quadrant depending upon anticipated benefit and the ease of implementation. Then logically I will put this greet and try to classify my various opinions or options in to priority action consider and eliminate.

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Let us quickly see an example case study of improving capacity utilization at let us say Ginger Hotel, Hyderabad.

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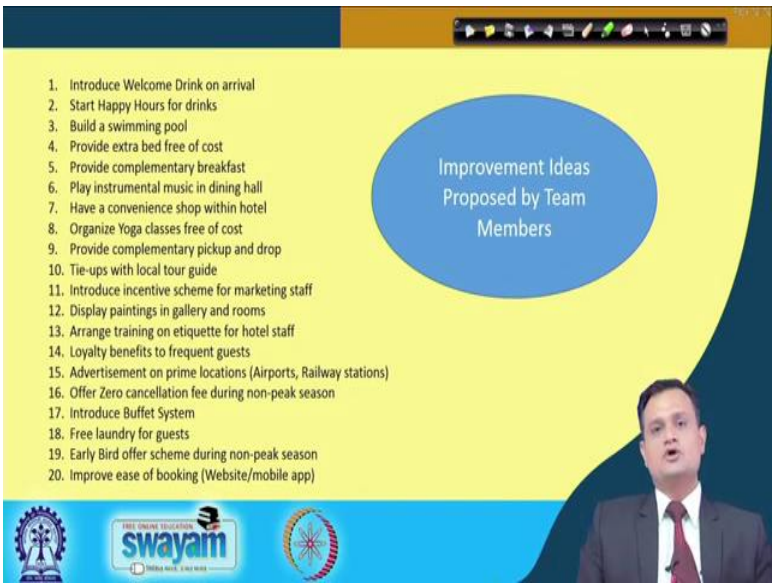

Now, the team including CEO of Ginger Hotel managers and the workers, they set together and they have exposed the poor capacity utilization data and then they started doing the brainstorming. As an outcome they could come out with various options like introduced welcome drink on arrival, I want the customer to be a loyal, satisfied and repeat. Start happy hours for drinks, build a swimming pool, tie-ups with local tour

guide, arrange training for hotel staff, loyalty benefits to frequent guests, free laundry. Now, fine fantastic many ideas came up, but now each idea has a cost and as well as there is a difficulty in terms of implementation.

So, if you see then there is anticipated benefit and there is ease of implementation or maybe the cost complexity involved in the implementation.

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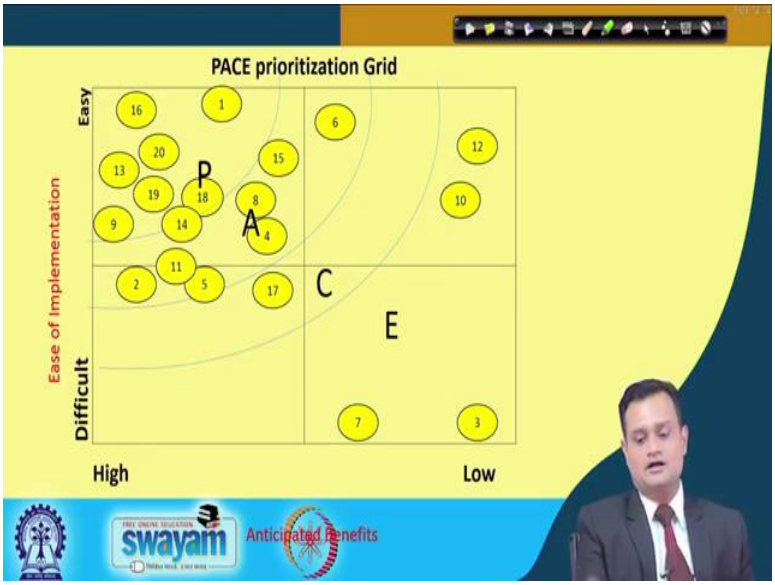

So, then depending upon this ease in implementation and your benefits that you can rip, this ideas were classified on pace prioritization grid and 4 quadrants each quadrant received some criteria. So, now, I am just putting logically the grid to separate them out into pace and what I say that P stands for priority, A stands for action, C stands for say you can see here that C stands for consider, and E stands for eliminate. So, I have just classified them as per PACE notation.

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And finally, what I could figure out that action to be implemented I got couple of options introduced welcome drink not very difficult and costly. Arranged training on etiquette for a hotel staff, offer zero cancellation free laundry and so on and finally, when further thinking was applied then I could find that I can I need not to work on all looking to my competitor and market condition even I can focus only on 3 out of 22 then I can really ensure the repeat business from the existing customers.

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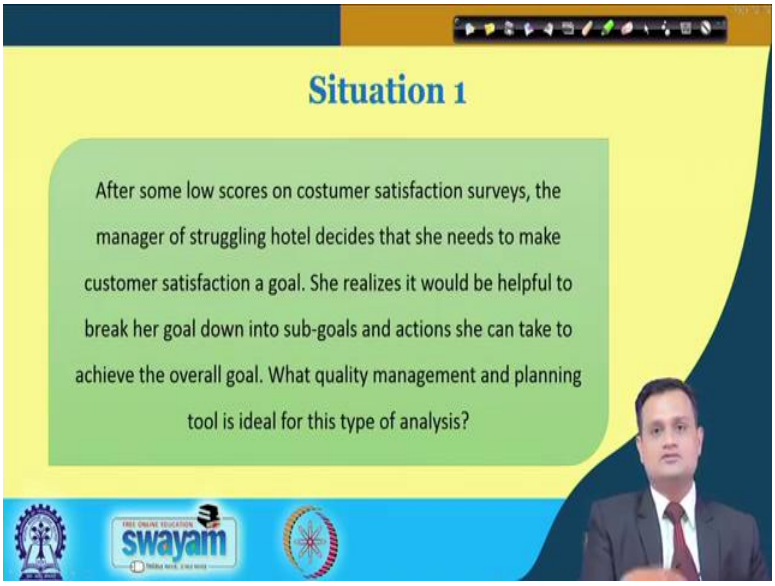

I would like to end this lecture with a small think it situations. So, there is a situation 1, after some low scores on customer satisfaction surveys, the manager of struggling hotel decides that she needs to make customer satisfaction a goal. She realizes it would be helpful to break her goal down into sub-goals and actions she can take to achieve the overall goal. What quality management and planning tool is ideal for this type of analysis? Give a thought, introspect, once again revisit all the part 1 and part 2 tools you have studied and then try to reflect on it.

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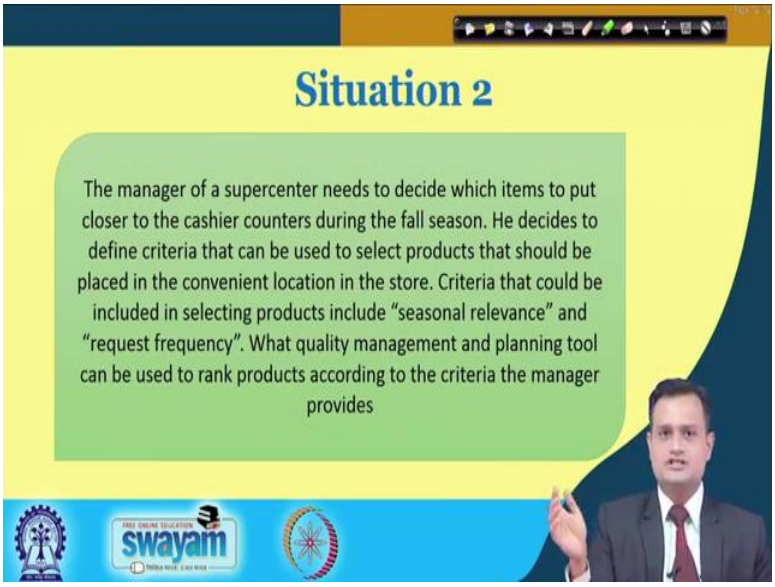

Situation 2: The manager of a supermarket needs to decide which items to put closer to the cashier counter during the fall season and he decides to define criteria that can be used to select products that should be placed in the convenient location in the store. Criteria that could be included in selecting products includes say seasonal relevance and request frequency you can consider these two. What quality management and planning tool can be used to rank the products? Because, you have a limited space besides your cashier counter and you need to figure out that at the time of exit what kind of our payment, what kind of articles, what kind of items customers would like to pick and this is a very interesting exercise.

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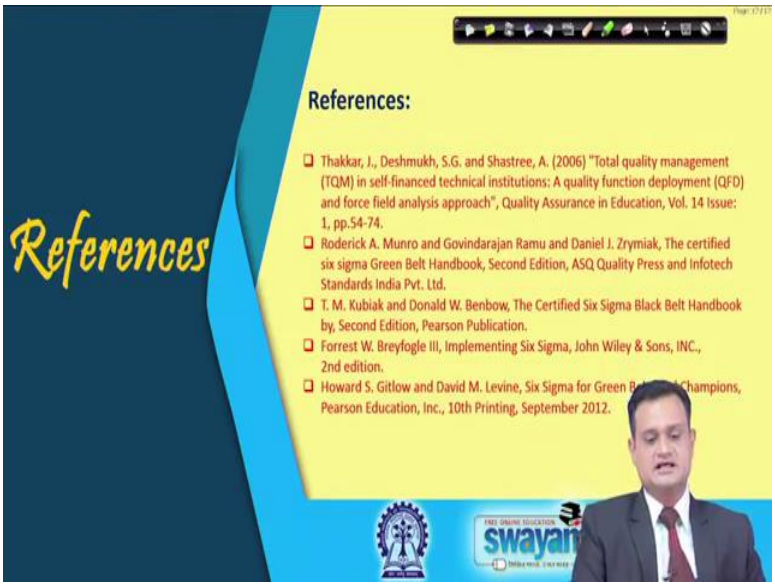

You can refer couple of references cited here for further understanding and depending your enquiry.

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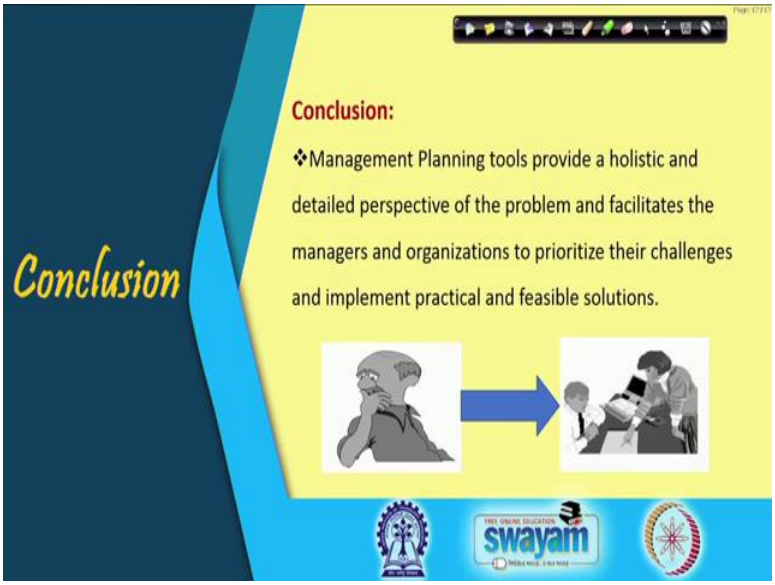

And I would say that management planning tools provide a holistic and detail perspective of the problem and facilitates the managers and organizations to prioritize their challenges and implement practical and feasible solutions.

So, with this thank you very much. You have gone through various management and planning tools in last two lectures as a part 1 and part 2 and I hope this will definitely

benefit you to investigate the issue with greater understanding and detail. Try to apply at least one or two tool in your day-to-day life and see the real magic that this tool can bring for you and with this let me end this session, be with me. We will continue in our journey with the new topic.