

**Manufacturing Strategy**  
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**Module No. #05**

**Lecture No. #25**

**Total Quality Management and Manufacturing Excellence**

Welcome, friends. This is the twenty fifth session, on this course on, Manufacturing Strategy. This is the end of, almost five weeks, of this course on Manufacturing Strategy. And, in our last few sessions, we discussed about, various taxonomies of Manufacturing Strategy. The idea of taxonomy developed, from American organisations. Roth and Miller, were the first contributors, in giving a very popular taxonomy, in the form of, Caretakers, Marketeers, and Innovators, which were later on validated, by the studies of Dixon.

And, then further, in year 2005, people came with an idea, of developing taxonomies, for country specific manufacturing organisations. And, the most important taxonomy, was for the Chinese manufacturing organisations. Because, very little was available, about Chinese strategy of manufacturing. And, when these Chinese strategies for manufacturing were available, people realised, that it is no longer, a low cost benefit, availed by Chinese organisations.

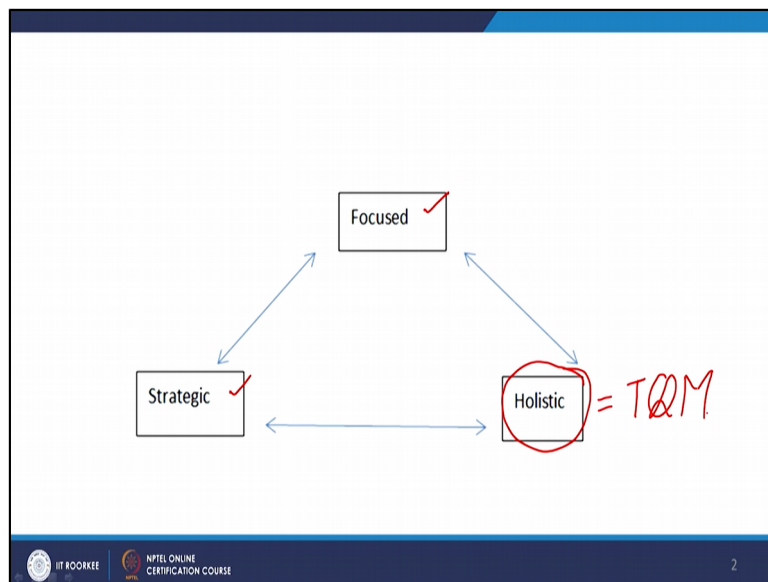
But, apart from these low-cost, there are many other things, which Chinese organisations developed, over a period of time. And therefore, even in that, the first type of taxonomy was, Quality Customizers, those who are able to produce, different types of products, and also maintaining the quality conformance. So, the point which I am trying to develop, is that, all across, various taxonomies, various ideas, of competing on manufacturing, were primarily based on two key principles.

One, was the traditional view of manufacturing, which was related, that how manufacturing can provide you, low cost product. And, as soon as, we were talking of quality, we thought of providing products, which are elite, which are exclusive, which are precious. So, that type of idea was attached, with the quality. But, when we started talking of, strategic role of manufacturing in the organisation, we somehow try to develop, that type of capabilities, where in manufacturing, we are able to provide, cost advantage, as well as, good quality.

And therefore, in our last session, we discussed the meaning of quality, that how quality can be defined, from the user's point of view, and how quality can be defined, from the manufacturer's point of view. And, in the last of that session, we discussed a trilogy, that quality needs to be developed, using that trilogy, where one dimension is focus, another dimension is strategic, and the third dimension is the holisticness.

So, in this session, starting with that trilogy, we will see, that how the concept of, Total Quality Management, has evolved. And, how this evolution of concept of Total Quality Management, is going to contribute, in the World Class Manufacturing, or Manufacturing Excellence. So, let us first see, that what is that trilogy, which we discussed, almost in the end of our previous session, that there are, three important dimensions.

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One is the focus. That, what is the meaning of focus? That, we will like to discuss, today. Then, quality can provide you, strategic advantage. So, how quality can provide you, strategic advantage? And then, we expect, the all comprehensiveness, the holisticness, in the use of quality principles. And, that is very close, to the idea of, this session, that is Total Quality Management. Now, let us see, when I say that, we need to have, a focused vision for the quality.

So, what do I mean, by this focused vision. Now, focus is required, in quality, with respect to targeting, a specific market segments. That, for a particular segment, what type of characteristics, are required? Here, I do not mean, that you have a market segment, on the basis of age, that this is a market segment of young children, this is a markets segment of

college going students, this is a market segment of adults. No like that. It has to be, on a very specific quality characteristic.

In our previous sessions, we discussed about, performance, and features. So now, what are that performance attributes? What are that future attributes? So, in some cases, my performance expectation is, if I am talking of a laser printer, so there can be a market, which is, let us say, my domestic market, if I am using a printer for my home purpose, I am satisfied, with a printing speed of, 10 pages per minute.

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• Focus is

- Targeting specific market segments
- Knowing customer requirements
- Specific areas of product and process improvements
- Focussed plant areas for specific customers and/or products
- But production can also be changed quickly to accommodate flexibility

Handwritten annotations in red ink:

- Domestic (circled) with an arrow pointing to "Targeting specific market segments"
- 10 ppm (circled) with an arrow pointing to "Knowing customer requirements"
- Heavy duty (circled) with an arrow pointing to "Targeting specific market segments"
- 32 ppm (circled) with an arrow pointing to "Knowing customer requirements"
- dpi ↓ (circled) with an arrow pointing to "Specific areas of product and process improvements"
- ↑ printing speed (circled) with an arrow pointing to "Focussed plant areas for specific customers and/or products"

Logos at the bottom: IIT Kharagpur, NPTEL ONLINE CERTIFICATION COURSE

But, if I am using a printer in a newspaper agency, here, I may like to have, a printing speed of somewhere like, 32 pages per minute. Now, there is a clear-cut division, on the basis of performance attribute, for these two different markets. So, you need to understand, that what are the specific market segments, you are targeting. If you are targeting, this market, where the speed requirement is very low, you will develop, a different type of quality attributes.

The other market, where the speed requirement is significantly high, you will have, a different type of quality attributes, in that product. Now, once you have, a specific market segments, the second point, is related to that, you can concentrate, on specific customer requirements. When you know, that I am going for, domestic users, or heavy-duty users. So, based on, whether I am going to serve, the domestic customers, or heavy-duty printers, I will specifically determine, that what are the expectations, what are the requirements, of those market segments.

So, this 10 pages per minute, or 32 pages per minute, is a result of, understanding my market segments. And therefore, I determine that, what are the requirements of that market segment. Then, the third key aspect on which I will focus, that what specific areas of product and process improvements are required. I need to focus, that yes, for achieving, these customer requirements, what specific product and process improvements are necessary, in my products.

May be, I am targeting, this heavy-duty customer. And, heavy-duty customer expects, a very fast rate of printing. Because, he needs to print, in bulk. And therefore, somehow, I need to have the mechanism in my printer, where heavy printing, or quick printing, is possible. Maybe, in that case, DPI may be low, because he wants quick prints. So, DPI may be low. So, I can think of a trade-off, that I can reduce the DPI, and I can increase the printing speed.

So, this type of combination, that Dots Per Inch can be reduced, so that, my printing speed can be improved. So, that is a very specific area of, product improvement. Similarly, process improvements. If there is too much of variation, we will need to do, some kind of process improvements, to reduce those variations. So, I need to see, my entire process. And, in that entire process, I need to see, where are scope of improvement.

And, we will discuss about, this particular aspect of process improvement, in our, this session, as well as in, our next session also. That, specific area of process improvement, is very important thing, in developing, or in overall aspects of, quality management. It is quite possible, that the reason of poor quality, may not be your production process. It may be, in your human resource department. It may be, in your purchase department. You are not able to procure, right kind of raw material.

And therefore, more and more products are getting failed, in the production stage. Or, there is increased variation, in the output, because of poor quality of input. If you are purchasing, let us say, HR Coil, Hot Rolled Coil. And, there is a good amount of variation, in the thickness of that HR Coil. And now, when you are converting that HR Coil, into CR Coil, Cold Rolled Coil, so to some extent, you can eliminate those variations. But, if the input variations are too much, it will be difficult for you to eliminate, all those variations in your CR Coil.

So obviously, there will be more variation, in the output of this kind of process. So, even if you have, best of the best process, but because your input is not very appropriate, output will

also be affected, because of it. So, we need to see, whether we require process improvement, in actual production process, or there may be lot of allied activities, in which, improvement may help us, in getting the right kind of output. So, that is another important area, when I am talking of focus. So, we need to have a specific focus, on the areas of improvement.

Then, another important thing, when we talk of focus, that we may have, focussed plant areas, for specific customers or products. Now, in organisations, we have a system of determining our, key account holders. We determine our key account holders. The key account holder is a term, which is used, to identify your important customers. Organisation may serve, large number of customers. But, out of those large number of customers, few customers are important customers. They are giving, maximum business to you.

And therefore, those key account holders, need special kind of attention. You need, special focus, on their requirements. It is a very simple thing, to understand. If one customer giving you, let us say, a business of 30% of your overall revenue. And, another customer is giving you, a business of just 2% of your overall business. So, if I prioritise my customers. On an ideal side, all customers are equal. I need to understand, requirement of all my customers.

But, on the practical side, on the side of doing management, it is important to prioritise the customers. And, in prioritising the customer, obviously, those customers who are giving me, more business, they will come, first in that ranking, and those who are giving less business, will go lower positions, in that ranking. So therefore, those customers, who are my key account holders, I need to have specific attention, I need to give specific product, specific requirements, for those customers.

And, for that purpose, may be within my plant, I can give, some specific location, where only the products related to, those specific customers are made. Or, I may depute, few personnel's to continuously interact, with those customers. Like, for an example, I purchase one HP computer. And, though, HP provides me, after sales services, whenever I get a trouble, whenever there is a problem in my computer, I can go to service centre of HP in my city.

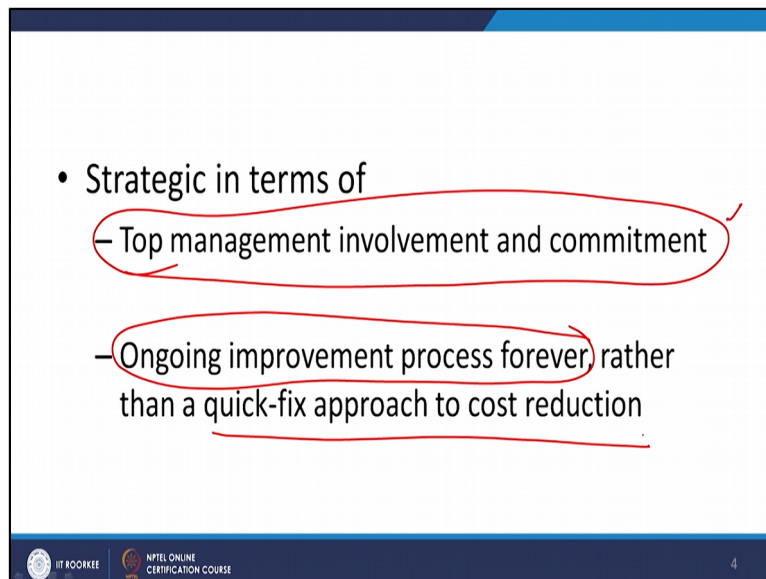
On the other hand, my institute also purchases HP computer. But, every year, my institute purchases, may be around 500 HP computers. And, because the institute purchases those computers, in such a large volume, that HP deposes a specific service engineer, 24x7, to my

campus, to fulfil the requirement of, our institute only. So, that is the meaning of, key account holder. And, you require a specific attention, you require a specific focus, on the requirements of your key account holders.

And, at the same time, you also need to keep focus, that how quickly you can accommodate, how quickly you can change, your product and processes, to meet the requirement of these key account holders. HP may not be like to serve, my changing requirements, immediately. But, HP will certainly like to serve, the requirements of my institute. Because, my institute is a key account holder, for the company. So, company gives, more priority, more focus, on the changing requirements, of the key account holder.

So, these are the different dimensions of focus, which starts, with understanding the market segment, their requirements, you develop some specific arrangement, for your key account holders, you can depute personnel's for your key account holders, or you can create some kind of space, you can make a factory within a factory, for your key account holders. So, these are the part of focus, in that quality trilogy. Then, the second important thing is, strategy. So, one thing was the, related to focus. The second important thing, is related to strategy.

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The slide displays a bulleted list under the heading 'Strategic in terms of'. The first bullet point is 'Top management involvement and commitment', and the second is 'Ongoing improvement process forever rather than a quick-fix approach to cost reduction'. Both bullet points are circled in red. The slide also features a footer with the IIT Kharagpur logo, the text 'NPTEL ONLINE CERTIFICATION COURSE', and the number '4'.

- Strategic in terms of
  - Top management involvement and commitment
  - Ongoing improvement process forever rather than a quick-fix approach to cost reduction

Now, when I talk of strategy in that quality trilogy, so strategic importance to quality, is in terms of, that we need top management involvement and commitment. Now, this is very important thing. This whole idea of quality, is impossible, without top management

commitment, and involvement. We discussed in our previous session, about the traditional view of the quality, and the enlightened view of quality.

Now, in the traditional view of quality, the quality was considered, to a lower level activity. Those, who are working at the shop floor, they were responsible for producing quality products. So, workers, machinist, supervisors, inspectors, they were primarily responsible, for quality products. So, it was considered a, low-level activity, which is to be dealt with, the frontline executives in the organisation.

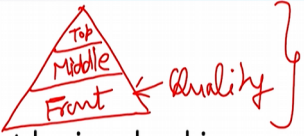
But, now, in the enlightened view of quality, it is more involvement of your top management. Without proper commitment, without proper involvement, of the top management of the organisation, quality related initiatives are impossible. So, strategic role of quality is only possible, when top management is involved, top management is committed, for the organisation wide quality revolution. So, that is one very important thing.


And then, another important thing in terms of, strategic involvement of quality is, that you need to have, ongoing improvement for process. The quality management related initiatives, are not project trained up activities. Rather, these are ongoing, these are regular activities, in the organisation. You can never be perfect. And therefore, quality related initiatives, require consistency. They require, the continuity, all the time. You cannot break it.


And therefore, how to develop that type of commitment, where you can continuously focus, on the quality related improvement activities. And, if you can do that, you can take the advantage of quality, for the strategic purpose. So, these are the two important thing. One is, the involvement of the top management, the commitment of the top management. And, second is, that it has to be an ongoing process, it has to be a continuous process, of improvement.

And, therefore, we can also say, that sometime, we understand that, manufacturing is a simply, by some who can crook, you want to achieve, just cost reduction. That, how you can reduce, cost? But, if a strategic role is involved, we need to change this mind set, from cost reduction quick fix approach, to the continuous improvement kind of approach. So, if we can do these two things, we can take the advantage of quality, for the strategic purpose.

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 Holistic: everybody must be involved in continuous improvement in every area and at all levels of the firm.

- This approach also includes suppliers and distributors in perusing quality.

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And, now coming to the third aspect, that is the holistictness, which I said, is very close to Total Quality Management. Now, what is holistictness says? It says that, everybody must be involved, in continuous improvement, in every area, and at all levels of the firm. So, as I was saying just, that earlier, the quality was considered to be a, low-level activity. It was considered to be, more related to, frontline executives.

So, if I see, different levels of management in an organisation, so this is the top-level, this is middle level, and this is frontline executives, those who are actually responsible, for execution of the task. So, initially, quality was more or less, responsibility of these people. But, when I say the holistic approach of quality, so now, the quality is applicable, all three stages are responsible. And just now, in the strategic aspect of quality, we discussed that, your top management commitment, is very, very important.

And, when I am saying the holistic approach of quality, I am saying that, it is not only top, not only front, but top, middle, and front, all three levels, all the people in the organisation, are responsible, for producing the quality products. So, that is about the, holistictness. And, if I further extend, this idea, so it is not, in your organisation, this is you. But nowadays, we have extended, the idea of quality, or holistictness idea of quality, to my customer side.

These are my distributors. And, these are my suppliers. So, I want to include, my suppliers, as well as my distributors, in understanding, my commitment towards quality. So, I am not limited, to my organisation. It is not, intra-organisation holistictness, rather it is, inter-



organisation holisticness. So, that is the overall approach, that is the overall idea, of this quality trilogy, where we have, three different dimensions.

And, we discuss that, how we can achieve focus, how we can achieve strategic role, and how to have the holisticness. And, based on this, we now come, to discuss this particular aspect that, how over a period of time, these changes have taken place, in the idea of quality, and their related activities.

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Stages of development in quality and related activities	
Stage of development	Activities
Inspection	Salvaging, sorting, grading and corrective actions
Quality Control	Quality manuals, product testing, basic quality planning including statistics
Quality Assurance	Third party approvals, advanced planning, systems audits, SPC
Company wide- QC	Quality measured in all areas of the firm
TQM	Continuous improvement, involvement of suppliers and customers, employee involvement and teamwork

Now, when I talk of quality, so initially, in the ancient time, when manufacturing activities started, may be in the, organised form, or unorganised form, so initial idea of manufacturing quality was related, with inspection. So, somebody is producing the product. And, at the end of your product line, there is an inspector. And, inspector was doing, the sorting of the products, grading of the products, and maybe, some corrective actions were also taken.

So, these are okay product, these are not-okay product, these are Grade-A product, these are Grade-B product, and accordingly, prices were fixed. That, Grade-A products are good quality, Grade-B products are slightly inferior. So, prices of Grade-B, are slightly lower. So, that type of system was there, initially, for the quality. So, those who were responsible, for making the quality, they were different people. Those who were, producing the products, they were different people.

And, those, who are actually deciding, whether it is a quality product or not a quality product, they were different people, they were the inspector. So initially, this was the idea of quality,

that is, inspection. After inspection, came the second time, that is the quality control. So, after inspection, we moved to this stage of quality, that is, quality control. Now, during this stage, we developed, some quality manuals, we developed, some kind of testing facilities.

And, it was beginning of use of statistics, in quality control. So, we thought that, quality can be controlled, during the production stage itself. So, quality became the part of, process itself, not after the process. So, that is the fundamental shift, from inspection to quality control. Inspection was taking place, once the entire product was manufactured. But now, during the manufacturing stage, how you can control the quality, that is the idea of quality control.

Then, improving further, we moved to stage of quality assurance. Now, in quality assurance, we started giving lot of emphasis, to statistical process controls. And, at the same time, third-party approval started. We started inviting, some other organisations, to approve our processes. And, this became, that if I am a producer, you are my customer.

So, on mutual agreement, we will invite some third party, which can certify, which can assure, you as a customer, that yes, this manufacturer is using, the appropriate kind of process, to manufacture your, or to deliver your products. So, this system of quality assurance, auditing of quality products, started. And then, we started, another approach. We came to that era, where we thought that, quality is not simply limited, to manufacturing function, or the production function, rather, we moved for, companywide quality control.

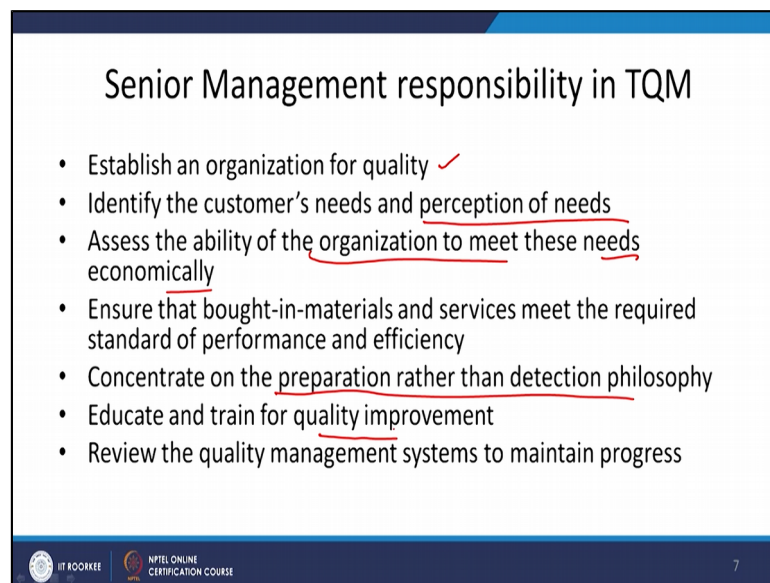
So, in all areas, whether it is after sales, whether it is purchase, whether it is maintenance, whether it is human resource, in all areas of organisation, we started working, we started thinking of quality controls. So, this became the starting point, for the concepts like, Total Quality Management, which is based on, continuous improvement, involvement of suppliers, involvement of your distributors. And, it is basically focusing, on the teamwork, and your employee involvement.

So, these are the, pillars of success of, Total Quality Management. If I want to have TQM in my organisation, I will like to have, a teamwork empowered employees, I want to integrate with my suppliers, on the one side, and with my distributors, on the other side. And, with this, I will continuously like to have, a system of improvement, in the organisation. As, when we

were discussing about, strategic role of quality, we discussed that, the top management of the organisation, plays a very important role, so in the case of, TQM also.

TQM, we discuss that, the whole organisation, people at different level, from top to frontline executives, are involved, in delivering a quality product, to the customer. And, this idea is only possible, it is a top-down approach, from one side, and it is bottom-up approach, from other side. Now, right now I am discussing the, top-down approach of, Total Quality Management.

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The slide is titled "Senior Management responsibility in TQM". It contains a bulleted list of seven responsibilities. The first bullet has a red checkmark. The second, third, fourth, and sixth bullets have red underlines. The slide also features logos for IIT Kharagpur and NPTEL Online Certification Course at the bottom left, and a page number '7' at the bottom right.

- Establish an organization for quality ✓
- Identify the customer's needs and perception of needs
- Assess the ability of the organization to meet these needs economically
- Ensure that bought-in-materials and services meet the required standard of performance and efficiency
- Concentrate on the preparation rather than detection philosophy
- Educate and train for quality improvement
- Review the quality management systems to maintain progress

And, when I am saying the top-down approach, it starts with commitment, it starts with the involvement of senior management, in doing the Total Quality Management. Now, in that, there are certain responsibility of top management, to achieve TQM in the organisation. So, they have to establish, an organisation, they need to inculcate, this idea, this philosophy of quality, in the organisation. They need to identify, what customers are doing, what customers are changing, with respect to, the various things happening in the environment.

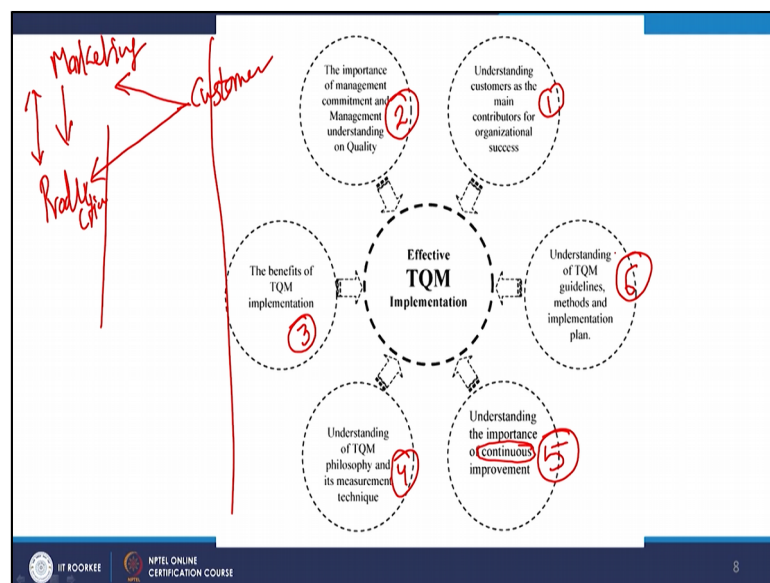
And, what your competitors are doing, to achieve those new requirements, of the customers. And accordingly, you also can anticipate, some of the needs of your customer. Because, we are talking of, using manufacturing for our competitive advantage. So, this perception of needs, this anticipation of needs, is also very important element, for a top management. Then, you also need to assess, the ability of the organisation, to meet these requirements, in limited resources.

One of the aspect of TQM, which is not much discussed, is that also, that you can fulfil the requirement of customers. But, how to fulfil those requirements, with available resources, or with economically, how can you fulfil the requirements of the customer, that is one aspect of TQM, which is not much discussed, in our literature, related to TQM, or Manufacturing Excellence. But, that is a very important thing about TQM, how you achieve requirements of customer, with available, or in the most economical manner.

So, that also, is an important thing. Then, you need to see that, how to achieve, standard performance? How to improve the efficiency? How to concentrate, on the preparation, rather than detection? So, we want to use this TQM Approach, for more process strengthening, so that, we do not require the detection. So, that is another important thing. That, we do, lot of investment, for detecting the faults. Rather, TQM says, that develop the process strength, develop the capability of your processes, so that, you can minimise your overall cost of quality.

And, that is very true, that those organisations, where TQM is successfully implemented, they are able to reduce their cost of quality, significantly, because of this change in approach, from detection to preparation. Then, you need to do, lot of training and education, of your employees, for the quality improvement. And then, you need to continuously review, your quality management system, and see, where is the scope of improvement. So, that is the important responsibility of senior management, in the TQM related activity.

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Now finally, if I see, the implementation of TQM, in my organisation. So, TQM can be implemented. And, the different dimensions, which can help us, in understanding the TQM implementation, it starts with that understanding customers, as the main contributor for organisation success. So, the important aspect of TQM is, how well, you are able to understand your customer. Before this TQM Approach, before this idea, the input to production, was coming from marketing.

So, marketing understands the customer, and marketing provides the input, to the production department. Now, in this case of TQM Approach, customer provides input, to both, marketing and production. And then, with the ideas like concurrent engineering, both these departments, both these functional areas, develop this idea, whether we are able to understand customer, correctly or not. So, the most important thing is, understanding the customer.

Then, another important point, which we are continuously emphasising, is the commitment of top management, and commitment to understand the role of quality, in serving the customer. Then, another important thing, and particularly from, Indian organisations point of view, I will like to say, that many of us, do not know, what is the benefit of implementing, this type of TQM Approach. So, we need to be very, very careful, or we need to do, lot of education and training, create awareness, of implementing TQM.

That, it is not simply a, new type of technique. But, how organisation is going to take, benefit out of TQM implementation. So, that is also an essential dimension, of TQM success. Then, what is the philosophy? It is not simply, some tools and techniques. TQM is not simply, tools and techniques. It is mind set. It is a philosophy. And, how to do work, with TQM philosophy. That is again a very important agenda, in our education and training of employees, that we should be able to change, their mind set.

And further, important element is, improvement activities, are not one-time activity. It is a regular activity. So, understanding, the importance of continuous improvement. So, this continuous word, is very important here, that it is an ongoing process, for ever, as long as, we are in organisation. And, I can say, up to, that in our life also, we need to continuously improve. You cannot be, stagnated. And therefore, even our ancient scriptures say, Charaiveti, Charaiveti. It means, we need to continuously, move forward.

And, that is what, the idea of TQM says, that you have to continuously, go on for the improvement. And finally, just for the sake of, how to implement it, we need to understand, the procedural aspects of, TQM implementation. That, what are the manuals, what are the tools, what are the checklist, what are the formats, you need to use, for implementing TQM, in your organisation.

So, for effective TQM implementation, these are the six different types of essential roles, six different types of essential dimensions, which organisation need to pay focus on. And, with that, if we implement TQM, it will help us, in achieving the Manufacturing Excellence. So, with this, we come to end of the session. Thank you, very much.