

Six Sigma
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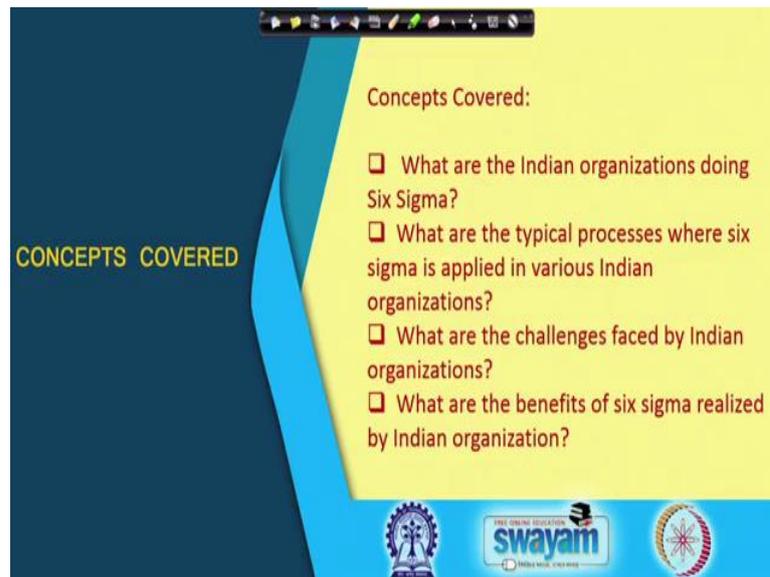
Lecture – 06
Six Sigma Applications

Hello friends, once again I welcome you to the journey of Six Sigma and I hope you are enjoying this journey and learning the various concepts thought in the various lectures. The last lecture was very important and if you just recall then we have discussed many important concepts. What is the difference between three sigma and Six Sigma? What does it mean when I say that the process means get shifted from the present position to another position by 1.5 sigma and even if there is a shift of 1.5 sigma if my processes are control under Six Sigma then I would be producing only 3.4 parts per million is defective.

We have also seen the concept of hidden factory and to appreciate the concept of hidden factory we have seen the concepts like FPY First Pass Yield and RTY Rolled Throughput Yield and how we waste our resources in terms of manpower, inventory, space, capacity when we have lot of scrap rejection and rework within the system. So, this where some of the important points we have discussed now this particular lecture 6 will help you to appreciate some of the applications of Six Sigma in Indian organizations.

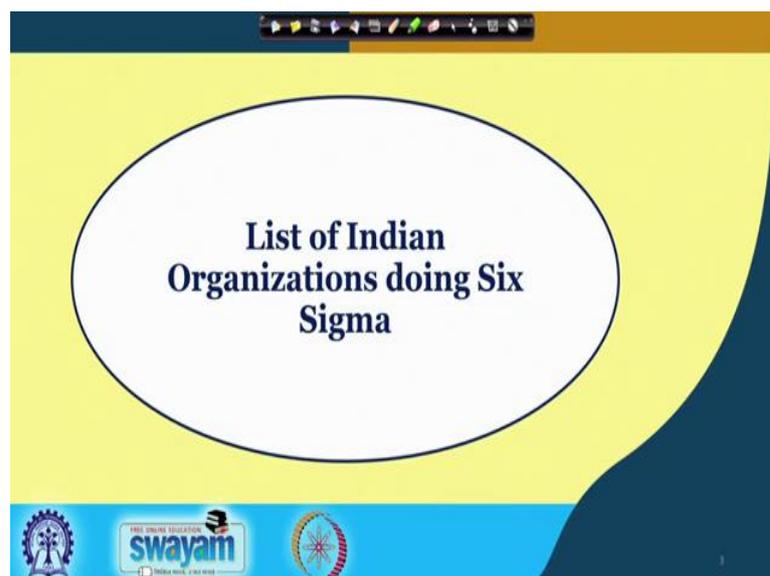
So, many Indian organizations they have successfully implemented Six Sigma in their various processes, it is not possible to discuss all the Six Sigma implementations, but just to motivate you I will discuss few and we will try to see that in what way Six Sigma is really benefited the companies. So, basically this particular lecture 6 will focus on what are the Indian organizations doing Six Sigma ?

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If you know what are the organizations then you can visit them, you can search the details on net or you can interact with their executives and you can also see that what kind of best practices they are following or in what way they have implemented the Six Sigma? Then what are the typical processes is where Six Sigma is applied in various Indian organizations, what are the typical challenges faced by them, and what are the benefits Six Sigma have extended to this Indian organizations.

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So, here is the list of Indian organizations doing Six Sigma in the various processes.

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So, you can just see it is representative list there could be many more company, but these are well known organizations reputed organizations Tata steel, TISCO, Taj Hotel, service industry, Cummins India Limited, Tata Consultancy Services IT sector, TATA Motors automobile, John Deere, Mahindra and Mahindra; Gabriel Motors, Nashik; WIPRO, TELCO, L & T, TVS Suzuki, Pidilite Industry, LG, Whirlpool, Asian Paints. So, you can see that the spectrum is large manufacturing automobile, service sector, paint industry, chemical industry. So, the Six Sigma and its benefits are not only restricted to one industry segment. But, you can see that successfully the industry operating in different different industry segment they have realized the benefits of Six Sigma.

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Larsen & Toubro:
Testing service level improvement. At the bottom, there are logos for 'swayam' (Free Online Education) and the Indian government emblem, along with a small video inset of a speaker in the bottom right corner.

Now, we will just discuss the Six Sigma application in some of the organizations; let us say organization 1 Larsen and Toubro and one of the process where they have successfully implemented Six Sigma is testing service level improvement.

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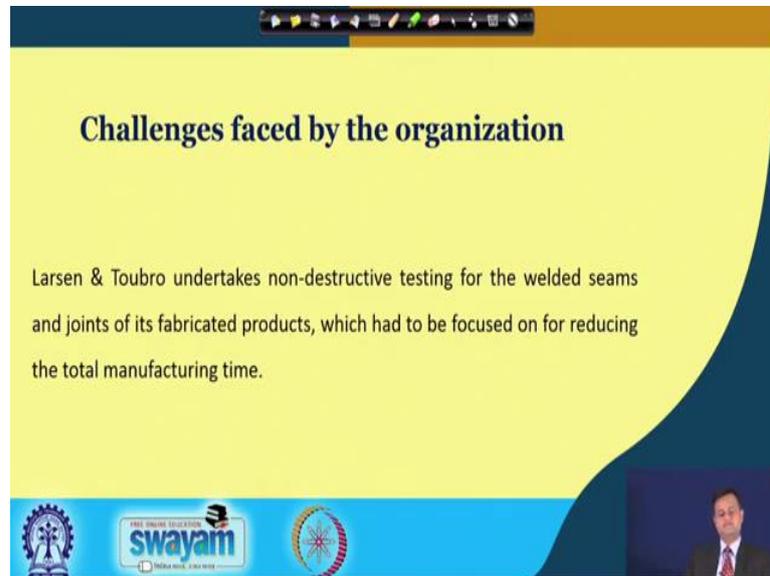
- Larsen & Toubro Limited is one of the largest and most respected companies in India's private sector.
- With over 75 years of a strong, customer focused approach and a continuous quest for world-class quality, L&T has unmatched capabilities across Technology, Engineering, Construction and Manufacturing, and maintains a leadership in all its major lines of business.

At the bottom, there are logos for 'swayam' (Free Online Education) and the Indian government emblem, along with a small video inset of a speaker in the bottom right corner.

So, at the background we all know the about the L & T, but L & T is one of the largest and most respected companies in India's private sector with over 75 years of strong customer focus approach and continuous quest for world class quality. L & T is a highly diversified organization L & T has unmatched capabilities, across technology,

engineering, construction, manufacturing and basically they maintain the leadership in all the major lines of business.

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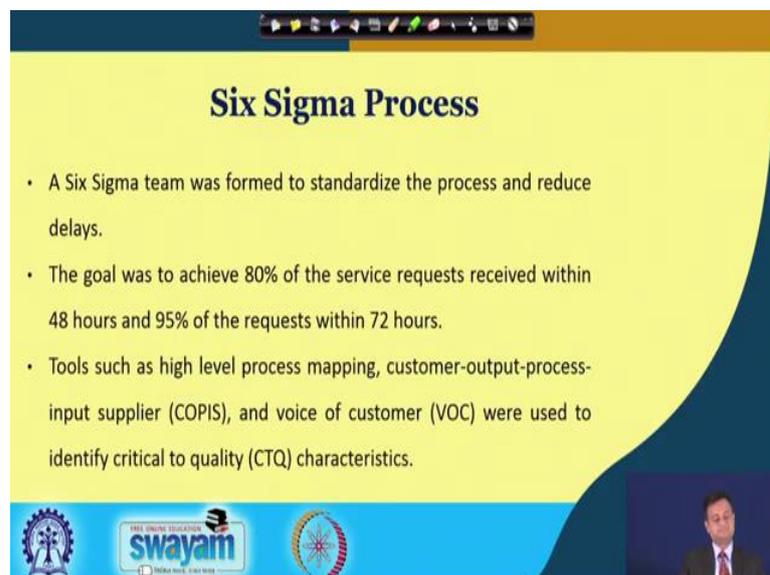
Challenges faced by the organization

Larsen & Toubro undertakes non-destructive testing for the welded seams and joints of its fabricated products, which had to be focused on for reducing the total manufacturing time.

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So, challenge the faced by the organization. So, L & T undertakes non destructive testing for the welded seams typically an example of manufacturing and welded seam and joints and it is fabricated products which had to be focused on for reducing the total manufacturing time. So, here critical to quality is reducing manufacturing time by focusing on one of the process that is your welded seam and joints.

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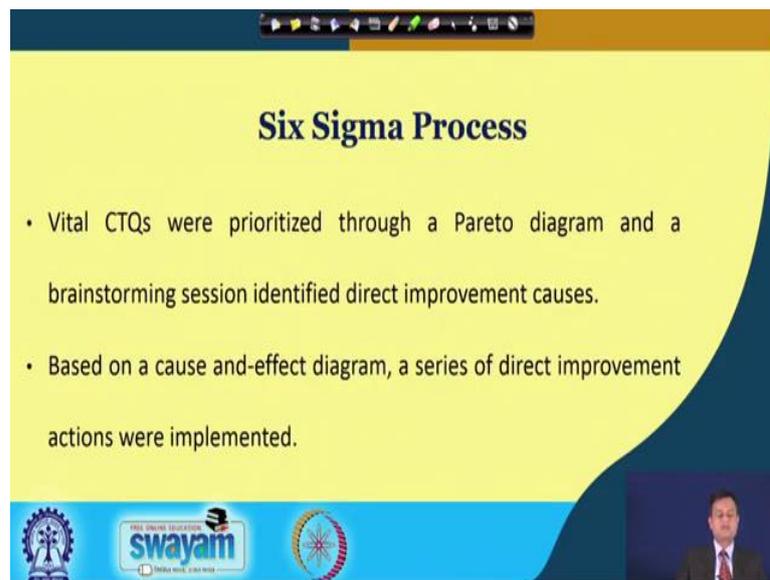
Six Sigma Process

- A Six Sigma team was formed to standardize the process and reduce delays.
- The goal was to achieve 80% of the service requests received within 48 hours and 95% of the requests within 72 hours.
- Tools such as high level process mapping, customer-output-process-input supplier (COPIS), and voice of customer (VOC) were used to identify critical to quality (CTQ) characteristics.

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Six Sigma team basically was formed to standardize the process and reduce delays, the goal was to achieve 80 percent of the service request received within 48 hours and 95 percent of the request within 72 hours. Tools such as high level process mapping, customer output process, input supplier COPIS or SIPOC sometimes it is called and voice of customer these are basically used to identify the first important thing that is CTQ Critical To Quality.

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Six Sigma Process

- Vital CTQs were prioritized through a Pareto diagram and a brainstorming session identified direct improvement causes.
- Based on a cause and-effect diagram, a series of direct improvement actions were implemented.

Logos at the bottom: Swayam (Free Online Education), and other institutional logos.

So, vital CTQ's were prioritized through Pareto diagram we will look into these various tools in the subsequent lectures, but Pareto diagram helps you to reduce your search it is a selective control kind of mechanism and it says that 20 percent of the problem they create maximum impact and if you focus on these then automatically system improvement is possible. So, brainstorming was conducted and based on cause and effect, a series of direct improvement actions were implemented.

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Benefits received through Six Sigma

- The resulting benefits were:
 - an increase in sigma levels by factor of 2.5; reduction in project cycle times by 7-15 days per project
 - overall increase in sales by Rs.600 crore
 - an expansion in capacity. L&T has included the IMC RBNQA criteria and as part of its quality management system.

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Now, the resulting benefits were increase in sigma level by factor of 2.5. So, reduction in project cycle time by 7 to 15 days per project, it is a very very significant achievement and if you see because usually we always get impressed when the improvement is presented in terms of money.

So, overall increase in sales by rupees 600 crore, you just see 2.5 sigma level increase has led to rupees 600 crore additional sales; in expansion incapacity L & T as included the IMC, RBNQA criteria and as part of it is quality management system.

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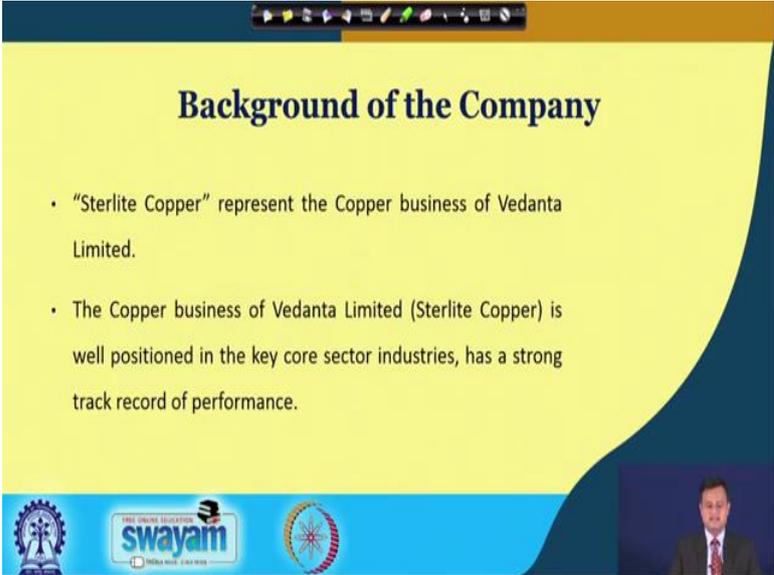
Organization 2:
Sterlite Industries:
Cycle time reduction of Cenvat credit availment

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So, this is a small journey of L & T in one of the process.

Organization two Sterlite Industries and here they wanted to implement Six Sigma for cycle time reduction of CENVAT credit availment.

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Background of the Company

- “Sterlite Copper” represent the Copper business of Vedanta Limited.
- The Copper business of Vedanta Limited (Sterlite Copper) is well positioned in the key core sector industries, has a strong track record of performance.

Logos at the bottom include Swayam and other institutional symbols. A small video inset shows a man in a suit.

So, just see what it is? So, Sterlite Copper basically represents the copper business of Vedanta limited the copper business of Vedanta limited Sterlite Copper is well position in the key core sector industries and has a strong track record of performance in terms of quality and timely delivery.

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Challenges faced by the organization

Sterlite Industries, a leading copper producer of India, was facing an accumulation of working capital in the form of Cenvat owing to the cycle time taken between goods received, consumed and credit availed. It urgently needed to significantly reduce the Cenvat availment cycle time from the current 58 days.

CENVAT means Central Value Added Tax.

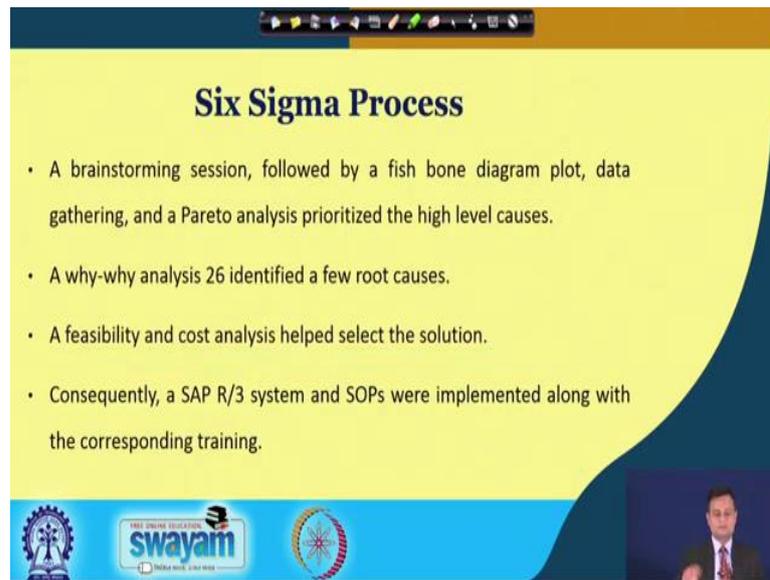
CENVAT credit is a credit in respect of central excise on inputs purchased for the manufacture or duty paid in relation to the manufacture of the final product.

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Now, just see what are the challenges faced by the organizations? Sterlite industry; it is a leading corporation in copper and typically they were facing an accumulation of working capital in the form of CENVAT owing to the cycle time taken between goods received, consumed, and credit availed.

So, now you will see that this is typically say a problem per tending to the transaction area, accounting area L & T we have seen the implementation of Six Sigma for a manufacturing process, here I am just exposing you to the application of Six Sigma for a transactional process accounting process. So, it urgently needed to significantly reduce the CENVAT availment cycle time from the current 58 days. So, you all know that CENVAT means Central Value Added Tax and typically Cenvat credit is the credit in respect of central excise on inputs purchased for the manufacture or duty paid in relation to the manufacture of the final product.

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Six Sigma Process

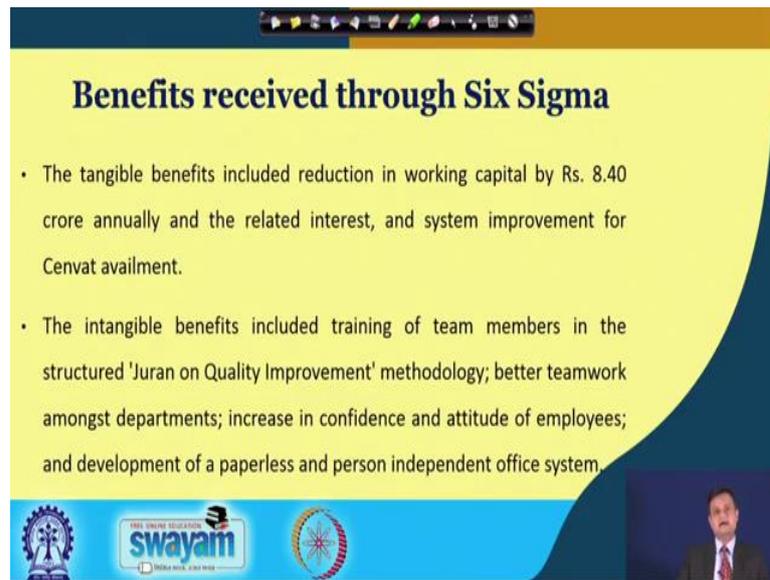
- A brainstorming session, followed by a fish bone diagram plot, data gathering, and a Pareto analysis prioritized the high level causes.
- A why-why analysis 26 identified a few root causes.
- A feasibility and cost analysis helped select the solution.
- Consequently, a SAP R/3 system and SOPs were implemented along with the corresponding training.



So, typically they also begin with brainstorming session, fishbone diagram to see the cause and effect, data gathering, Pareto chart and such kind of basic tools they have applied why-why analysis 26 identified as few root causes.

So, why-why analysis is a very very effective methodology to dig out and identify that what could be the root cause, you keep asking this why-why why this has happened and then you can really identify that what are the root causes. So, a feasible feasibility and cost analysis has helped to select the solutions and consequently SAP R/3 system and SOPs were implemented along with the corresponding training. So, fine they exactly figured out that what area needs to be addressed in order to reduce the cycle time and they implemented SAP R/3 to meet their requirement and the benefits were significant.

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Benefits received through Six Sigma

- The tangible benefits included reduction in working capital by Rs. 8.40 crore annually and the related interest, and system improvement for Cenvat availment.
- The intangible benefits included training of team members in the structured 'Juran on Quality Improvement' methodology; better teamwork amongst departments; increase in confidence and attitude of employees; and development of a paperless and person independent office system.

So, the tangible benefit included reduction in working capital by 8.4 crore annually. So, you just see that if I just go back then it was 58 days of cycle and this is what they wanted to reduce and this reduction in cycle led to the benefits, let us say 8.4 annually. So, intangible benefits included training of the team members in this structured Juran on quality improvement methodology, this has enhance learning capacity, team work amongst the various departments, increase the confidence, and attitude of the employees. So, typically this has resulted into quite a paperless office and person independent office system.

So, when you undertake the improvement definitely you will realize the tangible benefit, but simultaneously you can also see that there are many benefits you receive as a byproduct which in turn benefits many other processes.

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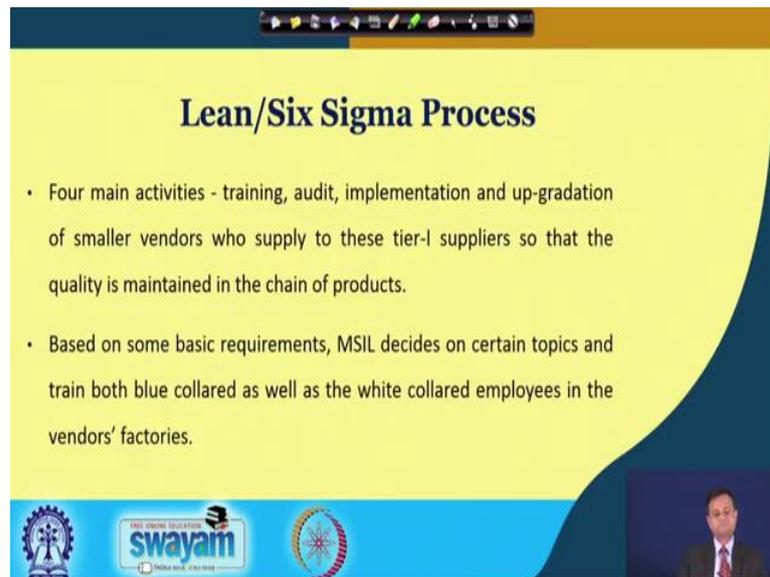
Let us see another well known organization three that is Maruti Suzuki India limited typically called as MSIL.

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Is a very well-known old organization and formerly it was known as Maruti Udyog limited automobile manufacture in India and 56.21 percent owned subsidiary of the Japanese car and motorcycle manufacturer Suzuki Motor Corporation.

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Lean/Six Sigma Process

- Four main activities - training, audit, implementation and up-gradation of smaller vendors who supply to these tier-I suppliers so that the quality is maintained in the chain of products.
- Based on some basic requirements, MSIL decides on certain topics and train both blue collared as well as the white collared employees in the vendors' factories.

swayam
MSIL

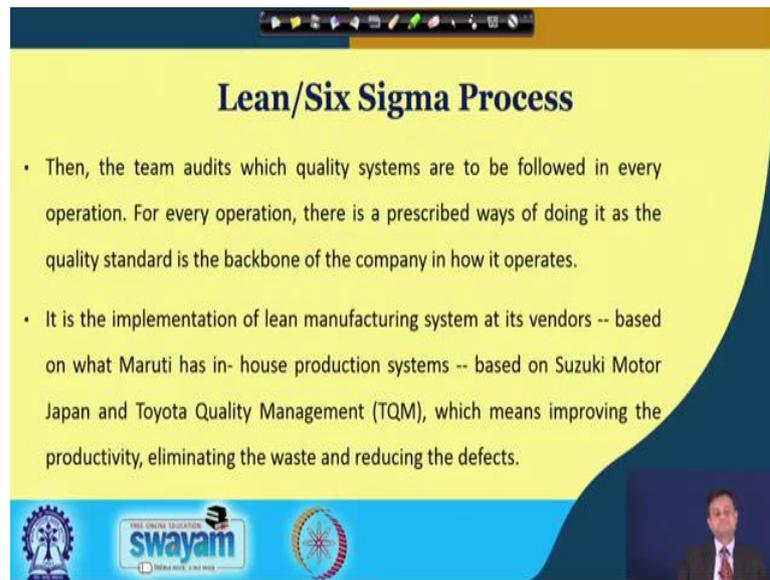
Here they have integrated lean and Six Sigma and they applied it this particular say approach for improving the value in their supply chain.

So, four main activities training, audit, implementation and up gradation typically of smaller vendor who supply to these tier 1 supplier so, that the quality is maintained. If you see the automobile company now a day's then they have gone for a totally modularization approach and typically the tier 1 supplier mainly it supply the modules kits and this kits are prepared at supplier 1 tier 1 supplier by based on the part supplied by the various small small vendors.

So, this way automobile company they go for this supplier base reduction. So, that they have to maintain the check at few points, but simultaneously if your modular component is not quality proven then you will find lot of issues in the performance of the vehicle. So, they wanted to implement certain things and training and improvement of the skills.

So, based on some basic requirement MSIL Maruti decides on certain topics and train both blue collared as well as white collared employees. So, operators, workers, managers all were trained at the vendor organization.

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Lean/Six Sigma Process

- Then, the team audits which quality systems are to be followed in every operation. For every operation, there is a prescribed way of doing it as the quality standard is the backbone of the company in how it operates.
- It is the implementation of lean manufacturing system at its vendors -- based on what Maruti has in-house production systems -- based on Suzuki Motor Japan and Toyota Quality Management (TQM), which means improving the productivity, eliminating the waste and reducing the defects.

Logos at the bottom: Ashoka Lion Capital, swayam (SWAYAM ONLINE EDUCATION), and Ashoka Chakra.

So, then the team audits which quality systems are to be followed in every operation and for every operation there is a prescribed way of doing something like standard operating procedure and quality standard to be achieved. So, it is the implementation of lean manufacturing and subsequently total quality management and other concepts that has helped the Maruti to drastically reduce the defect and wastages at the end of smaller vendors.

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Benefits received through Six Sigma

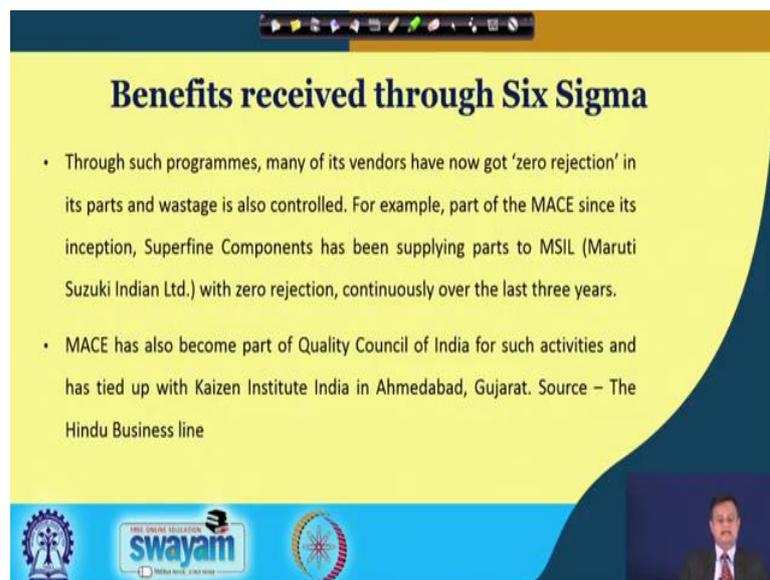
- The company through implementing lean manufacturing systems has 720 projects completed so far for productivity improvement, quality, and inventory control and energy conservation. MACE (Maruti Suzuki Centre for Excellence) has worked with 146 tier-II vendors for overall improvement in performance resulting in reduction in rejections from 10,933 to 1,180 products per month and defect reduction from 432 to 146 per month.
- The MACE program also aims at achieving Zero Defects and has been successful. It has been able to address the issue of ensuring high quality even at the hands of contract labourers.

Logos at the bottom: Ashoka Lion Capital, swayam (SWAYAM ONLINE EDUCATION), and Ashoka Chakra.

So, if you see the tangible benefits received through this Six Sigma and lean then company through implementing this lean manufacturing system has 720 projects completed so far for productivity improvement, quality, inventory control and many other say benefits. So, Maruti Suzuki centre for excellence they have say worked hard on this parameters and they worked with 146 tier 2 vendors for overall improvement in performance. Typically you will be surprised to know that resulting in reduction in rejection from 10933 to 1180.

So, just 1180 is the final defect or rejection that they could achieve and then defect reduction from 432 to 146 per month. So, you can just see that how much significant advantage they have received by implementing lean and Six Sigma and MSC program also aims at achieving zero defect and has been successful. So, this is the small story about implementation of Six Sigma and lean practices at say Maruti.

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Benefits received through Six Sigma

- Through such programmes, many of its vendors have now got 'zero rejection' in its parts and wastage is also controlled. For example, part of the MACE since its inception, Superfine Components has been supplying parts to MSIL (Maruti Suzuki Indian Ltd.) with zero rejection, continuously over the last three years.
- MACE has also become part of Quality Council of India for such activities and has tied up with Kaizen Institute India in Ahmedabad, Gujarat. Source – The Hindu Business line

Now, when they launch such kind of training programs improvement programs vendors they could achieve the better capability better performance in terms of quality delivery and many other things and now got zero rejection in it is part.

So, this is the excellent achievement vendors have achieved and when you talk about the supply chain or value chain improvement cost reduction quality improvement anywhere will ultimately benefit the final product and the customer. So, MACE now has become part of quality council of India in such a excellent manner they executed that it has

become part of quality council of India and tied up with Kaizen Institute India in Ahmadabad.

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So, this is the success story of Maruti. Now, let us see organization 4 that is Tata motors.

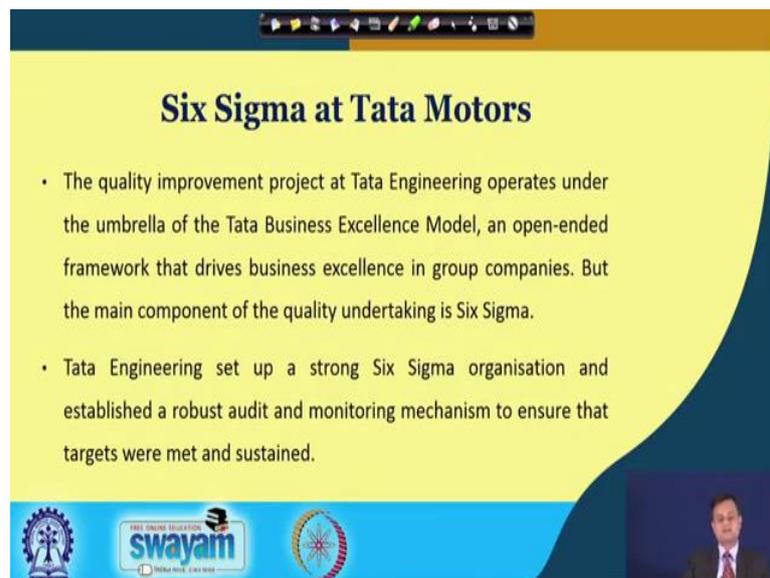
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So, Tata motor is well known for implementing various continuous improvement programs since last 30 to 40 years and they are really established benchmark performance in many many areas.

So, Tata motors limited say USD 45 billion organization is a leading automobile manufacturer with portfolio that includes cars, utility vehicles, trucks, buses, defence. So, all sorts of vehicles and our marque can be found they say that on and off road in over 175 countries around the globe. So, this is what Tata motors they take pride in having the presence across the globe and it is the India's largest and the only original equipment manufacturer offering extensive range of integrated smart and e-mobility solutions.

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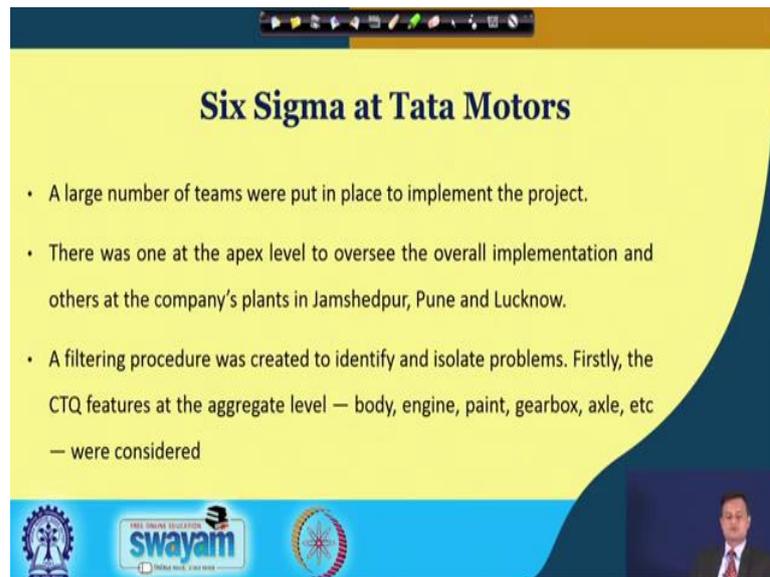
Six Sigma at Tata Motors

- The quality improvement project at Tata Engineering operates under the umbrella of the Tata Business Excellence Model, an open-ended framework that drives business excellence in group companies. But the main component of the quality undertaking is Six Sigma.
- Tata Engineering set up a strong Six Sigma organisation and established a robust audit and monitoring mechanism to ensure that targets were met and sustained.

So, now let us see that what they have realized through Six Sigma. So, the quality improvement project at Tata engineering operates under the umbrella of Tata business excellence model.

So, like Maruti establish their excellence model similar way Tata they have put all sort so all such kind of continuous improvement practices under the umbrella of Tata excellence model, business excellence model it is an open ended framework and which includes Six Sigma as one of the strategy. So, engineering set up a strong Six Sigma organization and established robust audit monitoring mechanism to ensure that targets were met and sustained.

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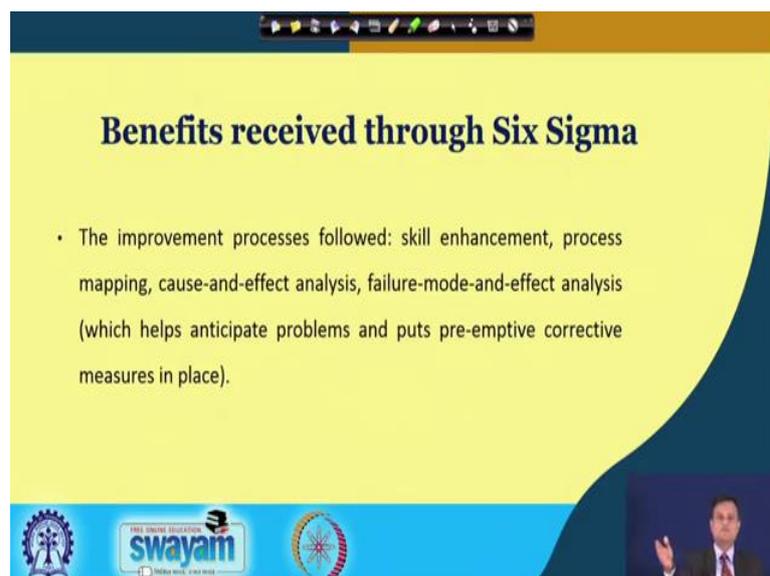
Six Sigma at Tata Motors

- A large number of teams were put in place to implement the project.
- There was one at the apex level to oversee the overall implementation and others at the company's plants in Jamshedpur, Pune and Lucknow.
- A filtering procedure was created to identify and isolate problems. Firstly, the CTQ features at the aggregate level — body, engine, paint, gearbox, axle, etc — were considered

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So, here large number of teams were put in place to implement the project there was one at the apex level to oversee the overall implementation and other at the company level shop floor level plant level in Jamshedpur, Pune, and Lucknow and a filtering process procedure was created to identify and isolate problems. So, firstly, the CTQ features at the aggregate level maybe body, engine, paint, gearbox, axle were considered and then that could be subdivided into further CTQ's.

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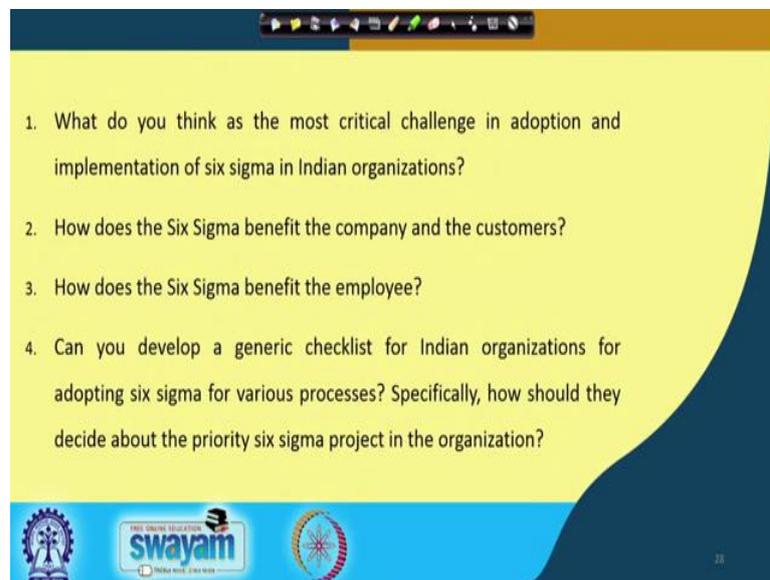
Benefits received through Six Sigma

- The improvement processes followed: skill enhancement, process mapping, cause-and-effect analysis, failure-mode-and-effect analysis (which helps anticipate problems and puts pre-emptive corrective measures in place).

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So, typically I just explain hear that Tata motors fascination about continuous improvement and Six Sigma and how they try to deploy implement the Six Sigma. So, the improvement process followed skill enhancement, process mapping, cause and effect analysis, failure mode effect analysis FMEA and basically this is helps them to anticipate the problems timely and put the pre-emptive efforts in solving the problems. So, with this say discussion of couple of organizations implementing Six Sigma in India and who have realized the significance benefits in terms of quality, profitability, reduction in cycle time, I just want to post before I end couple of questions for thinking.

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So, what do you think has the most critical challenge in adoption and implementation of Six Sigma in Indian organizations? How does the Six Sigma benefit the company and the customers? How does the Six Sigma benefit the employee? See remember that company is benefited customers are benefited, but I have internal customers they are my employee. And when they live in a in an environment where quality persist where the best practices are implemented intern it also leads to say day by day improvement in their attitude, way of thinking and also standard of living.

So, can you develop finally, a generic checklist for Indian organizations for adapting Six Sigma for various processes. And specifically, how should they decide about the priority Six Sigma project in the organization. I am just posing here quite open ended questions for thinking.

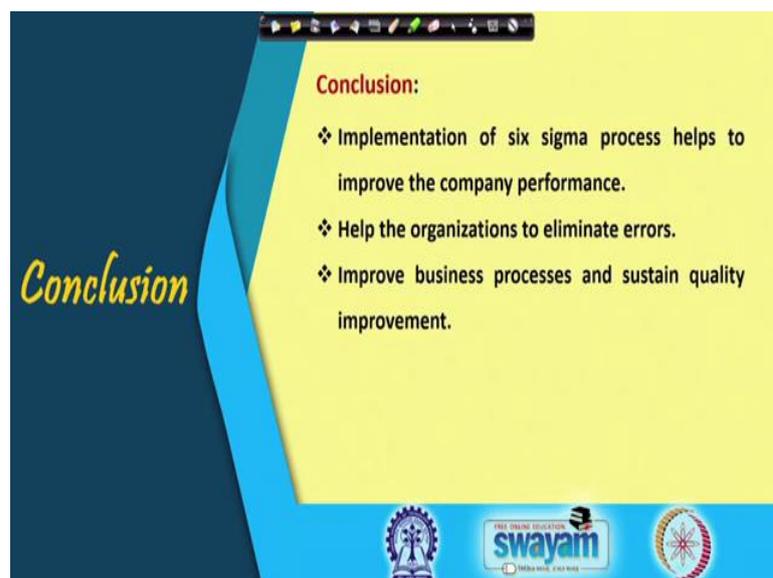
So, that you participate and you take better interest in the upcoming lectures.

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Ah you can refer couple of links from where some literature I have referred and you will find many more such applications of Six Sigma in various Indian organizations. So, you can refer this and better understand the importance of Six Sigma. So, the final remark of this lecture 6 is that implementation of Six Sigma basically helps to improve the company performance.

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It helps the organization to eliminate errors and improve the business processes and sustain quality improvement. So, with this note, I thank you very much for your interest and patience in learning Six Sigma course. We will one again discuss new issue, important issue in our journey of Six Sigma. I would request you to revise and introspect, internalize the various concepts. If possible interact with the industry and also try to see that the concepts delivered through this lecture series you can really visualize and see in the actual practices of the company .

So, thank you very much and be with me.