Six Sigma
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Lecture - 03
History of Continuous Improvement

Hello friends, I am Dr. Jitesh Thakkar from Department of Industrial and Systems Engineering. I welcome you to the journey of Six Sigma. We have already completed 2 lectures and seen the importance of quality and the various dimensions that a company needs to look for in order to be competitive in the global market. Now in this particular lecture 3, I will take you through the journey of continuous improvement, History of Continuous Improvement.

If you see then almost 100 and 110 years back people have started concerning about the quality, the resources are limited and you have to utilize them effectively. So, no company can afford very high rejections, rework, poor skill of the people and so on. So, people have started their quality efforts since last 100 years and various initiatives were taken. So, we will go through all these initiatives and see that how the concept of quality has become more and more competitive and how the company has evolved in their maturity, as well as their competitiveness in terms of adapting quality as a key weapon.

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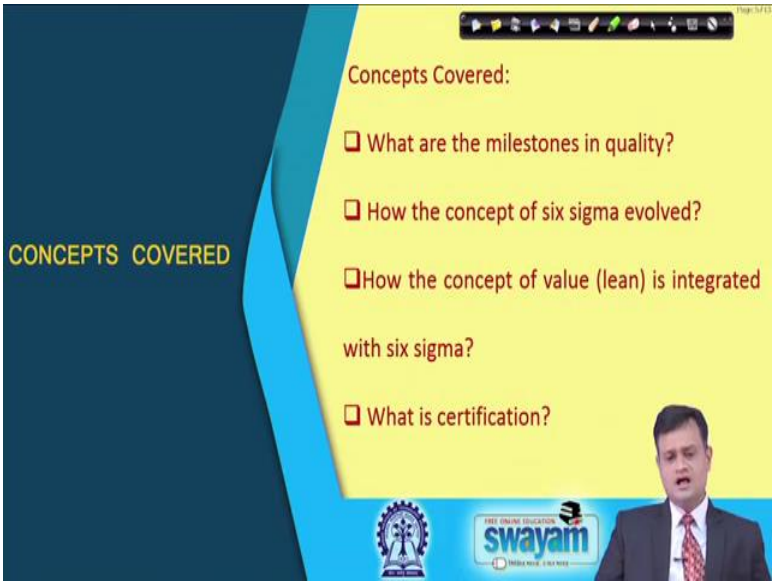

So, I will try to focus on what are the milestones in the quality, how the concepts of six sigma evolved over a period of time, how the concept of value lean is integrated with six sigma in order to derive synergistic effect and see that companies can become more and more competitive and what is certification? So, let us first see the history of continuous improvement and what are the milestones that the industries they have gone through and today they are able to provide excellent and competitive product to the customers.

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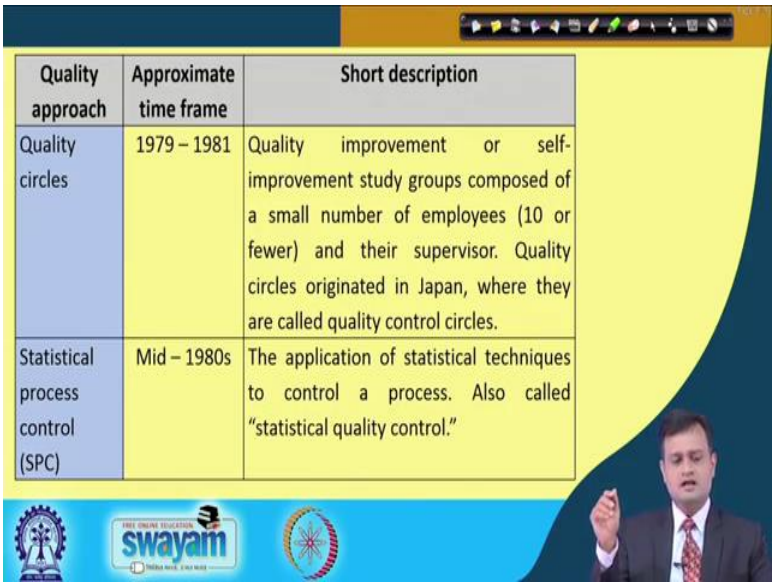

If you see then the first initiative in this history during 1979 and 81 that was the quality circle. Before that also as I mentioned the concern for quality was there, but more formal practices have been evolved since 1970's and so on. So, during this 1979 quality circle was the main tool and quality circle basically comprises some 10 to 15 people and this people they meet regularly. They may be from various functions, it could be a cross functional team and they will pick up some small problems, discuss on it and then they try to come out with some amicable solution based on their experience.

So, this particular strategy was adopted by say Japan and they felt that quality is not only the concern of inspection department, it should be the concern of each and every function involved in it and hence it is only the people who can really say discuss their quality problem and deliver the solutions. Subsequently people realize as the complexity of the process is increased, magnified that we need to be more say supported by the mathematical and statistical approaches in order to establish a good control over our

processes. So, the application of statistical techniques control to the processes typically called as statistical quality control was started and this has benefited the companies a lot.

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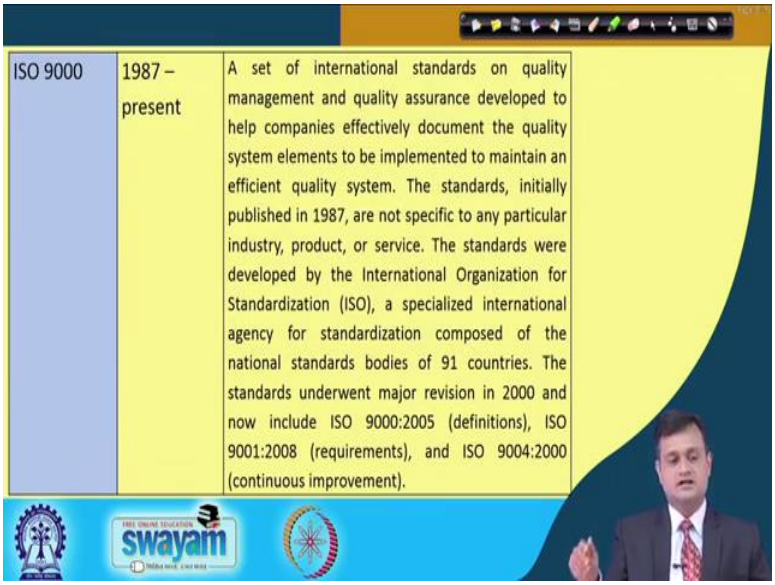

Subsequently people realize that fine I have the various processes under control and everything, but there is a need to have assurance for my quality. It means I should be able to meet certain standard and because I certify for this standards, I should be seen as the potential partner in the supply chain. It should increase my credibility across the world and I should be recognized as the credible supplier manufacturer in the value chain.

So, various initiatives were taken and say international organization for standards called ISO, they say helped the company in manufacturing as well as service sector and they provided basically the broader guidelines. Within these broader guidelines, the company and the function and the process owner basically they have to develop the complete process and the standards for controlling it. So, you can see that the standards underwent major revision in 2000, now, it includes 9000 to 2005, definitions 9001 to 2008 requirements and 9004 to 2000 that is more focusing on the continuous improvement.

So, this was a very much important breakthrough in the journey of quality which has helped the companies to establish their credibility.

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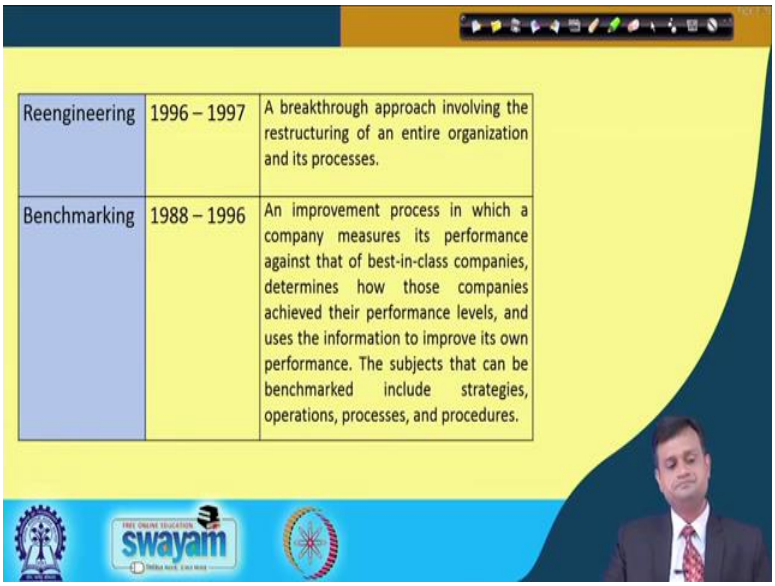

Subsequently say in the time period of 1996 to 1997 say there was a need of reengineering, it is realized by some of the organizations. They found that their processes functions whether administrative manufacturing, they are not aligning with the overall vision, objectives, mission, their company has said as a part of their ISO and other quality practices. So, now, in order to align your system people administration and the processes you need to restructure your organization and hence its processes.

Also the adoption of ERP and many other IT tools, force the organizations to look for reengineering and hence the quality improvement was realized through the concept of reengineering. Then what has happened that companies they have become more and more matured in their quality journey, they started delivering better and better products and the competition has been intensified.

And this intensified competition has led the organization to 1 more domain and that is benchmarking. So, later on we will see benchmarking in detail, but here I would like to say that benchmarking is a process by which I humbly accept that within my industry or other industry, there exists the best practice and if I compare my practices with the best practice, then I will get a thrive motivation for bridging the gap and in the process I can improve the quality.

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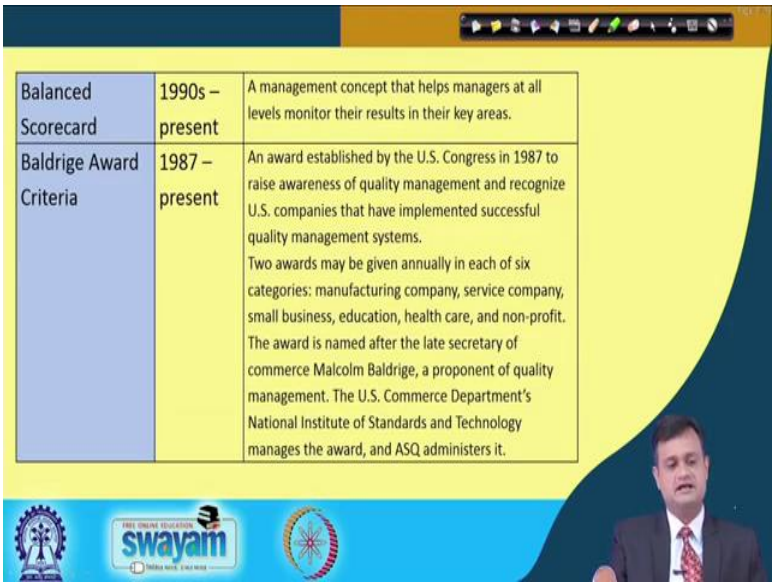

So, this was the time of benchmarking; subsequently the article is published in Harvard business review on balance score card and this concept basically has helped the company indirectly to look at their quality perspective. Now indirectly means, this balance score card says that you cannot ensure the sustainability of the organization, just by measuring financial performance. You need to also look at your processes and you need to measure your performance in 3 other dimensions.

So, these 3 dimensions include your innovation capabilities and learning capability, your internal process measurement and your people related issue. So, these 3 dimensions if you do not measure in addition to the financial performance, then you cannot really realize that in what way you should go ahead in the journey of quality. Then subsequently, there were in fact, many awards, but the most prestigious award in the quality is the one that is the Baldrige award.

So, many organizations across the world also say in India, they strike for this award and Malcolm Baldrige evaluation framework checklist was developed and the organization as a whole in terms of leadership, in terms of their processes, in terms of the people related issues. And, many other they are assessed with respect to the say well established checklist of Baldrige award and then they are awarded this prestigious recognition.

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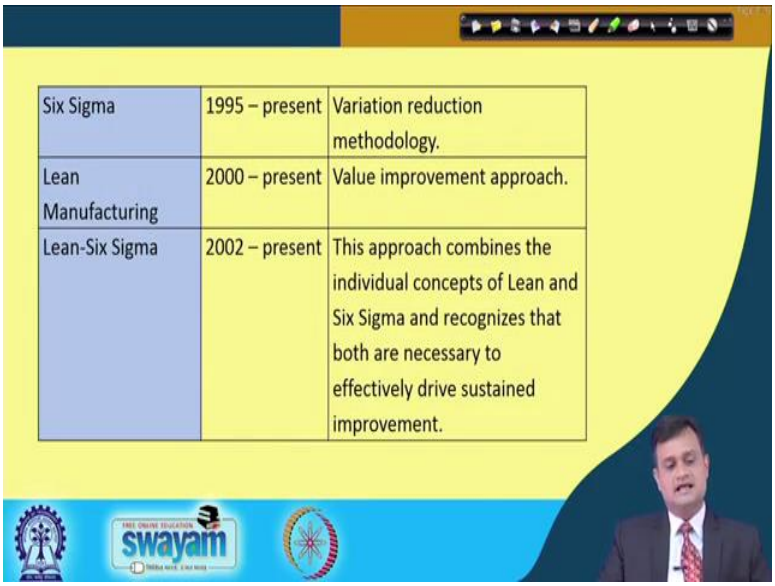

Then the course which we are say going through is six sigma and mainly 1995 onwards, in fact, this six sigma concept as I told was developed by Motorola and maybe as 7-8 years back this concept they started implementing, but usually it has been seen that this concept has become very much popular since, 1995 and till today, the companies service and manufacturing both they are receiving the immense benefits.

So, if you see the key of six sigma then it is all about reducing variability. Variation is the enemy and if you can reduce the variations, you would be producing better products, a grade products delivering a great services and the value of the products and services will obviously, be very high. Subsequently say 2000 onwards the lean concept came in picture and we all know that Toyota has set the benchmark established the excellence through their lean manufacturing practices.

Toyota production system is a well known system in the world, which is proved that even by adopting some simple principles how you can improve your processes, how you can opt for the better quality. So, this concept was mainly value improvement approach and it has focused on reduction of the waste and mainly creation of the value.

Subsequently 2002 onwards people have realized why to have 2 separate approaches, why not to integrate them and there was a logic. They said that let me first refine the system with the lean concept and try to see that system becomes less bulky, system become standardized, system becomes free from the wastages and people working in the

system they are motivated, empowered and following set of practices which in turn will enhance their morale. Once you qualify for this and then if you go for six sigma, you really achieve this synergy these 2 approaches.

So, lean and six sigma now is not seen as 2 distinct approach, industries they also do not want to waste their administrative efforts and say top management do not want to invest in different management philosophies. So, lean and six sigma now as a whole is seen, as a competitive strategy to address the quality competitiveness for any service or manufacturing organization.

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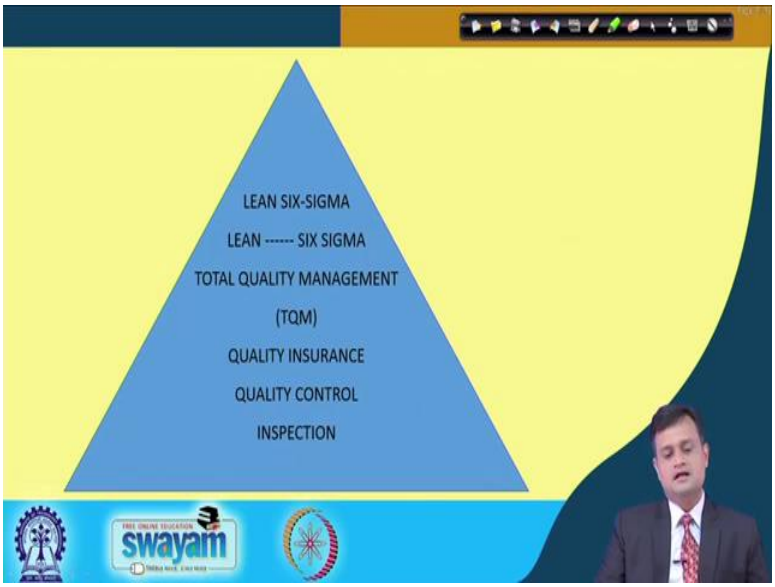

Now, just to summarize whatever I have a say elaborated, if you see the step by step journey, then inspection was the first one; obviously, you will agree that inspection cannot really help, it just helps me to identify bad product and separate it out either for reject or rework, but the question still remains why I have produced the bad products? So, then the concept came that is quality control as I said, then quality assurance, then total quality management, lean six sigma separately and then lean six sigma as a whole.

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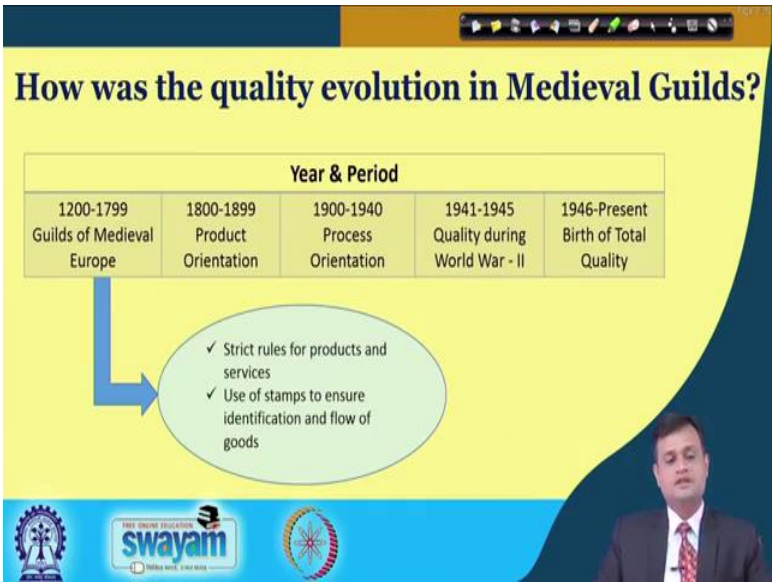

Now, let us try to appreciate this journey in a different way and try to see that what people were doing in the various phases. So, 1200 to 1799, you see in one way or other, we had the manufacturing system, we had the factory system and people were concerned about the quality. So, this was the era of Guilds of Medieval Europe. It means you had various traits based on the skills, unions, maybe groups, you can say and there these strict rules for products and services were followed and typically in order to track my product and maintain the floor stamps were used.

Subsequently 1800 to 1899, the focus has changed and we have become more say more concentrated on product orientation. So, it was the era of industrial revolution, trades were divided as I said that previously it was the trade culture, now trades were divided into special task, I want to go by the specific skill and required that skill by a particular task. So, typically this was a well-known era of Taylorism.

So, Taylor system was developed for scientific management and obviously, when you repetitively do a particular work, it gives you the learning effect and because of the steep learning curve, your productivity and quality both improves. And then heavy emphasis on inspection for quality control, so this was again say emphasis on inspection was more then, 1900 to 1940, you can see that we have entered into the process orientation.

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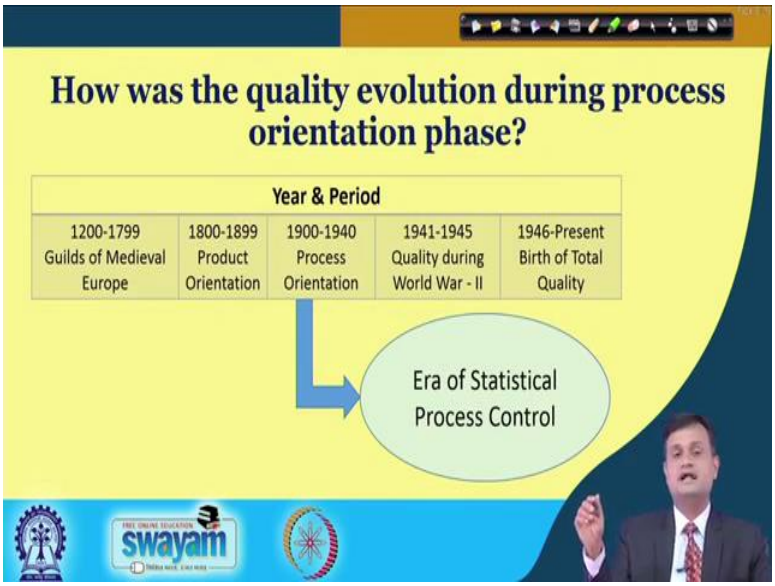

Now, from product, we have gone one step backward; it means people started thinking that why to control at the product level. If I can control my processes which is producing either product or service, then a good process meaning to say a well controlled process having less variability will definitely deliver better quality products and services. So, typically as I mentioned that this was an era where statistical process control was the tool and since then we have always appreciated the use of statistical process control for establishing a good control over the processes.

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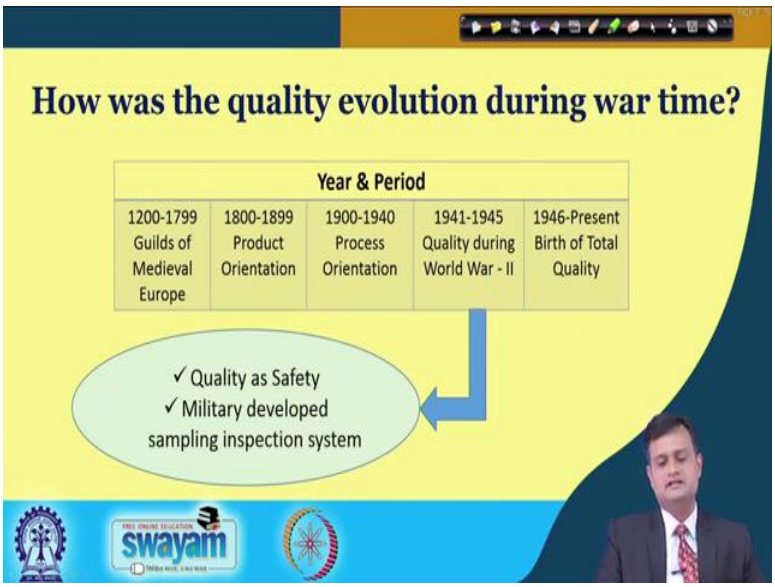

Subsequently say during the World War II, there was another juncture and the quality had again catched the attention of defense sector as well as the industry. And here the quality has received another dimension that is safety. So, typically many military systems were developed for acceptance sampling and other things so that, even if you are working with a sample you can ensure that your quality is not much compromised and military basically defense sector they contributed a lot in the say era or in this era and quality was strengthened.

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Then 1946 to present typically we see this; obviously, you can put six sigma and other thing, as the era of total quality management, as well as six sigma, so Japanese quality improvement and empowerment of the people, employee. So, lot of literature is developed, company they started considering their people as their asset, they realize that if you do not improve the morale spirit of the people, then they cannot really deliver the quality and unless the internalize the processes, the importance of quality they can never commit for any quality either in administration or manufacturing.

And hence, the people training empowerment motivation leadership many other issues as a part of total quality management have become a central focus part of the quality journey.

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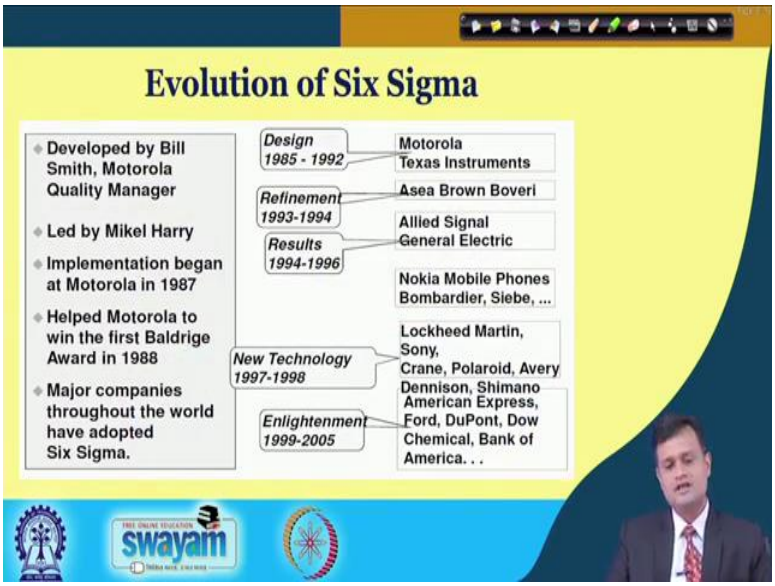

Now, if you just see the evolution of six sigma which is the central focus of this particular course, then it is developed by Bill Smith, Motorola, a quality manager led by Mikel Harry implemented begin at Motorola in 1987. And, this particular strategy focused on DMAIC, define measure analyze improve and control has helped the Motorola to win the first Baldrige award in 1988.

Then many companies, throughout the world they adapted this six sigma and they realized the immense benefits. So, I have presented the timeline that 1885 to 1992 Motorola, then some refinements Asea Brown Boveri and then Allied Signal General Electric, Nokia mobile phones and Bombardier, Siebe and subsequently say Lockheed Martin, Sony many companies well known organizations. And then for DuPont, Dow Chemical, Bank of America, they realized the significant benefits of this six sigma approach.

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So, if you just see how six sigma originated at Motorola then, Motorola was facing a serious competitive challenge from Japanese pagers in late 1970's. So, usually it is said that unless you realize a need, you do not discover. So, that was the time for Motorola to really think critically and investigate how they can survive and compete. So, Motorola lost a substantial market share and made huge losses. Motorola quality had not deteriorated in 1980, compared to earlier and the competition was offering much better products. So, the consensus was that our quality stinks.

Motorola introspected accepted that yes, we have a quality problem. And then the question comes, how do we make better product, A grade product, competitive product, which can satisfy the customer in terms of quality at the lesser price.

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So, they realized that the variation you can see the shape. This is typically bell shaped, normal distribution and we will see this shape again and again and discuss many issues specific to the variability, but variability is the enemy. Now please understand that I cannot convert these into one line.

So, for example, if you say that can I really say put a line here and reduce or eliminate all the variability. Sorry, this is absolutely not possible you cannot have the product exactly produced at the target or service, but yes, it is quite possible to centre my process by reducing the variability and reducing the variability means, I would be producing better product grade A product, which will receive higher value.

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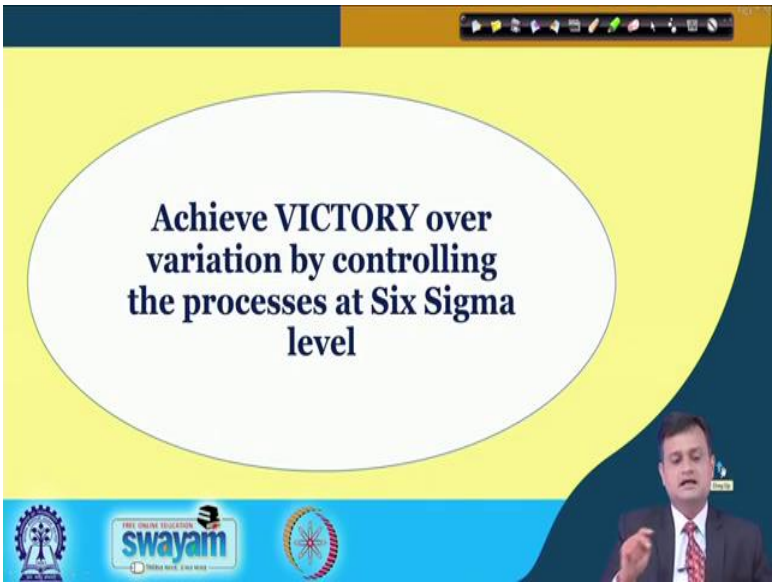

So, now if we see further, then achieve victory over variation, by controlling the processes at six sigma level. I would just like to remind you that six sigma is a journey, it is a philosophy, it is a kind of set of tools and techniques which helps you to improve your quality. Now six sigma is not just like a wrapper, that you will put on the chocolate and your chocolate will have a great taste, it is not possible. What is possible is to understand that a particular process in your organization is at what sigma level and there is a procedure we will see how to find it out.

Now, once you figure out that my process is at 2 sigma level then, you need to set a systematic cycle of DMAIC in order to see that I can achieve a reasonable improvement from maybe 2 sigma to 3 sigma or 3.5 sigma in next six month or one year. Once you achieve that, once again set your reasonable target, once again operate with the DMAIC cycle address, the new issues and this will help you to keep on going till you reach to the six sigma.

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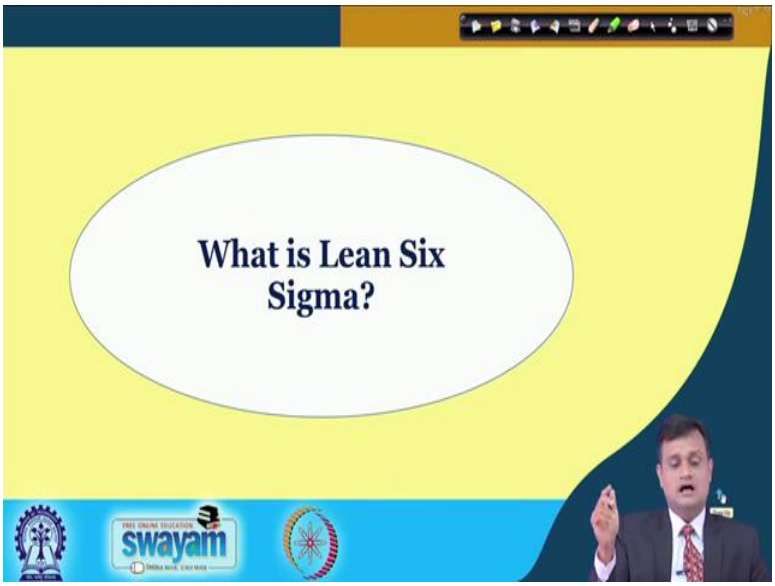

So, typically as I mentioned that six sigma and lean can give you the best say integration and synergy, let us just little bit see that how this synergy is possible.

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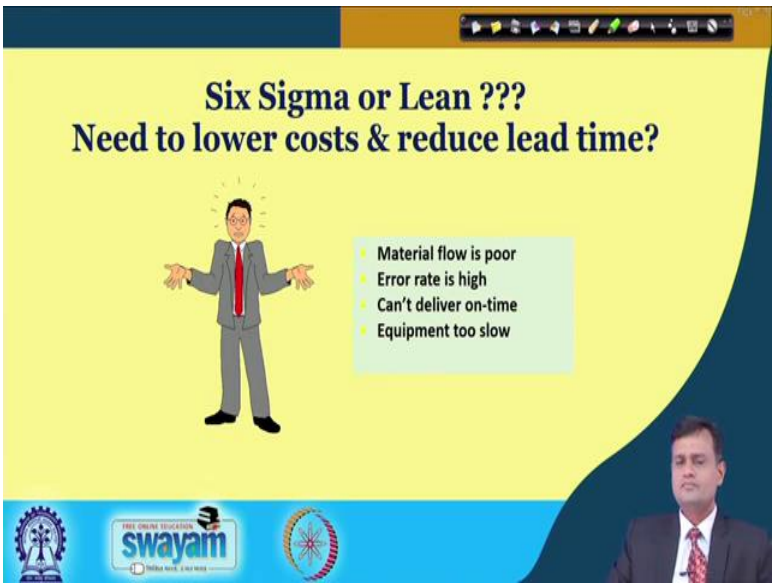

So, whether we need six sigma or lean, I need not to answer both are necessary and synergy is the best. So, there are various indications my material flow is poor, error rate is very high, my people are struggling with the quality, there are lot of customer complaint equipments are too slow.

Now, when you are faced with all such issues, you need to think, you need to introspect and see that how you can really take the advantage of lean and six sigma in an integrated way to improve upon your quality dimensions.

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So, typically if you see, then lean manufacturing reduces lead time by eliminating waste in the value stream, provides the game plan and place; it means it empowers the people to specific task make them responsible, enhances the morale and take their commitment. Six sigma, as I said reduces process variation and it provides the play by play analysis instant replay, so, you can keep repeating DMAIC cycle and see that yes, I can further improve, further improve and move my process from present sigma to next sigma.

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Six sigma or lean manufacturing, lean manufacturing is flow forecast, lean cannot bring process under statistical control, that emphasize is not there Japanese in that era we not very much impressed by statistical quality control. So, mainly US organizations they were going by their statistical quality control and Japanese organizations they are more on the lean part. So fine, but both the approaches are extremely useful. So, in summary I can say we need both.

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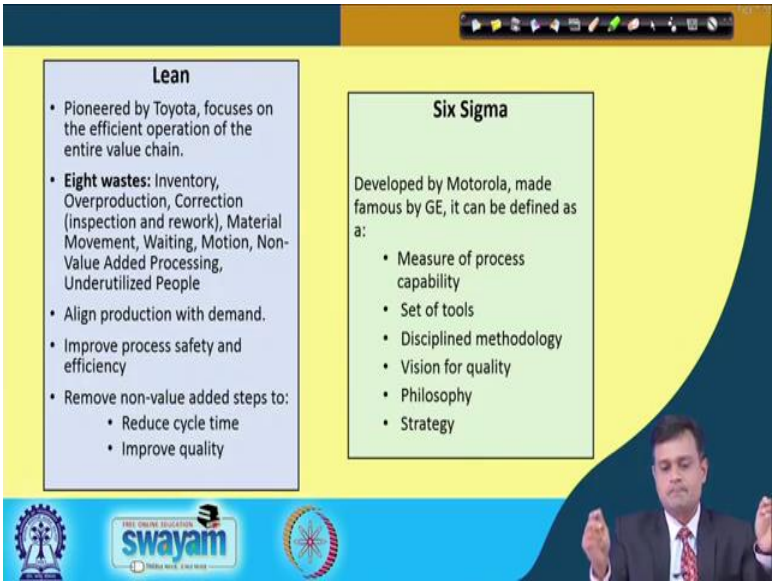

So, I just put the summary to compare lean and six sigma. In lean typically we talk about 8 waste initially, it was 7, inventory over production, correction, inspection rework material movement, waiting motion, non value added processing underutilized people, six sigma as I said it mainly focuses on reducing the process variability.

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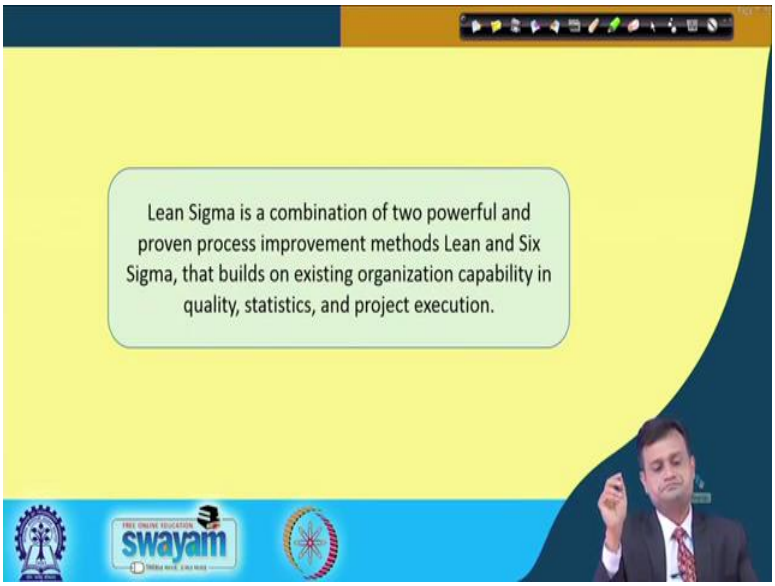

So, it is a combination of 2 powerful techniques and we try to leverage the capability of some of the tools like 5 s, value stream mapping and hand on Poka Yoke many other approaches of lean, as well as statistical quality control in the say lean six sigma.

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So, integrating sigma, six sigma, with lean leads lot of competitive advantage, in terms of customer satisfaction, profitability improvement historical integration problem can be resolved and different system model is required.

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Finally if I just summarize this lecture, then what are the key advantages of continuous improvement?

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We say that continuous improvement it is a journey. I can never say that I have reached to the peak and achieved everything in my life. Same way an organization cannot say that they are the best in the industry and it will remain forever.

Always remember there is a concept called quality winner and quality qualifier. Suppose you consider your present quality and the competitive price as your quality winner today, this will become your qualified tomorrow. So, any quality winner becomes a qualifier, quality qualifier tomorrow and hence a company must put their people processes, system administration in the continuous improvement and this is the only way to sustain and move ahead in your journey.

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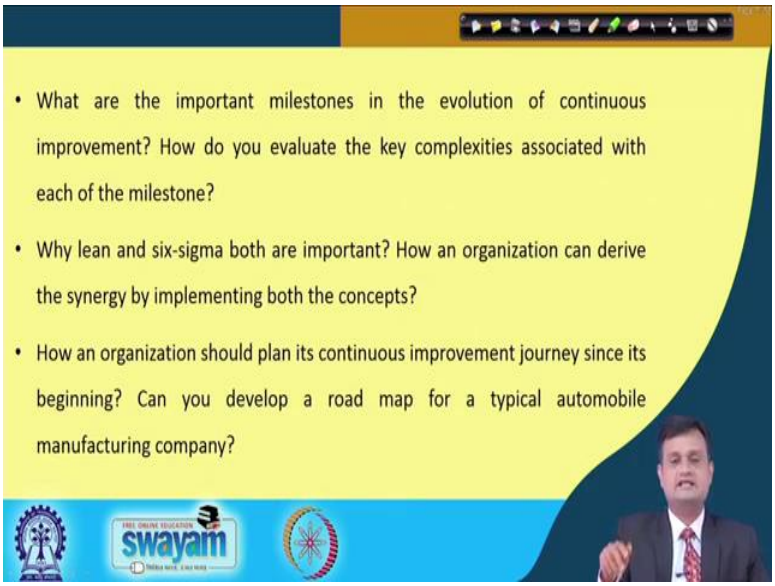

Now, I would like to end the lecture with couple of interesting questions. You can think do the brainstorming with your friends, colleagues in the industry and just try to internalize the concepts we have covered in this particular session. So, first what are the important milestones in the evolution of continuous improvement? How do you evaluate the key complexities associated with each of the milestones? How do you see the milestones as well as associated complexity in terms of people and processes? Why lean and six sigma both are important? How an organization can derive the synergy by implementing both the concepts? And finally, how an organization should plan its continuous improvement journey since, it is beginning?

Day 1, you must plan your continuous improvement journey. Please understand you cannot achieve everything in one day, but there is a saying that a journey of 1000 miles begins with a single step and that is where your continuous improvement journey has a role to play. Now just can you develop a roadmap for a typical automobile manufacturing company? Just do the brainstorming, read about the characteristics of automobile company, go through couple of cases and just think that suppose you want to open an automobile company what kind of roadmap you will set in terms of milestones and in terms of quality initiatives, that can help the company to become internationally recognized organization.

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So, these are some of the references I have used for say delivering this lecture you can go through for further detail. Thank you very much and we will meet again in the next lecture with few more concepts on quality, enjoy the journey be with me.