Six Sigma
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Module No. # 01
Lecture No. # 11
QFD and ISO 9000

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Good afternoon, we start again, we resume our lecture here. And couple of topics I would like to go over in this particular session here. The first one is going to be QFD quality function deployment, which you see on the screen. QFD is it stands for quality function deployment. It says Japanese technique that has also been called the house of quality and it is a way to translate the voice of the customer. What is that the customer wants, how does he express his requirements to product specifications, products that we would like to produce and offer to the same customer.

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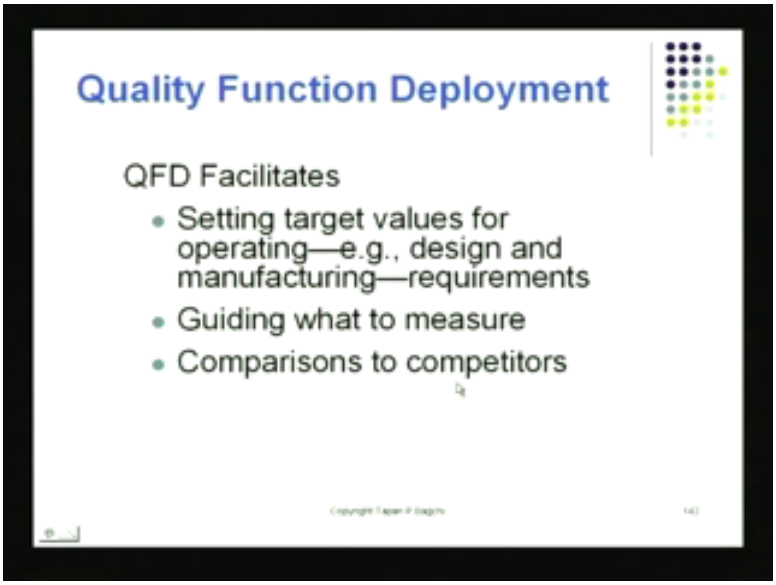

QFD facilitates, what does it facilitate it helps us setting the target values for the operating and design of finished products and requirements. It is guiding what to measure when production is going on, it also provides us guidance there. And it compares, it is helps us to provide competition, helps us to provide a comparison to competition that is also is something that QFD is able to do.

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Unless try to think of what is it exactly going on. For a minute, what I would like you to do is, consider a product like the cell phone here. Let us say this cell phone is available

and there is a good market for it and you would like actually to come up with the new cell phone. You would like to come up with a new cell phone.

Where would you like to actually make a start there? You could probably just give gap another cell phone and produce one exactly like that, that you could do. But, there could be many things that are wrong with the existing cell phone. There may be memory issues, battery life issues, you know features issues and so on and so forth. The size of the screen, the capabilities, does it have a camera all those things might be an issue there. And for example, multimedia does it have a multimedia capability and so on and so forth.

How do you, then come up with your new phone, you are going to be designing a new cell phone. How do you come up with the features for that new cell phone? Which are going to be not bells and whistles? What things that are going to be really useful for a prop for the customer, let us see how we approach that task?

What we are going to be doing is, we are going to be translating, we are going to be translating customer requirements in two requirements. And these become technical requirements that I can utilize for designing the product or for production. Thereby, I will have improved production, also I will improve communication, also I will have good team work between all the different people who are involved in doing this for example, in the full value chain. I have provided her with a little website that also you can look at once you go out there and you try to do this till you get some more details on this particular issue.

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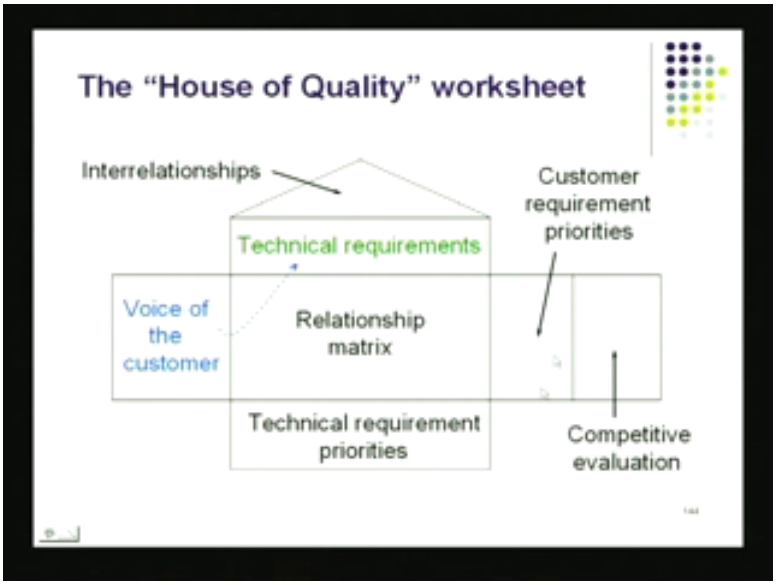

Now, the QFD procedure quality function deployment procedure it uses a work sheet. And the work sheet itself is called the house of quality because, it looks like a house. What does it have, it has the left wall which is the voice of the customer and list out all the different requirements by talking to the customers, I have put them down there.

My goal is to come up with technical requirements, technical requirements of the final product. So, you start with requirements of the product, I start with the voice of the customer. The customer tells me I want A B C D E F G H all these are my requirements. I would like to convert those requirement, those requirements that I got into the specification for the final product, this my goal. So, I am not coming up with from these requirements, I want to go to design specification that is what I will like to be able to do. Then of course, from design specification I would like to go to the manufacturing process. And then of course, I would like to go to quality control also to make sure I go through those steps.

So, I first talk to the customer, I come up with design specification, then I go to requirements, then I go to manufacturing specification, then I go to details of the process and quality assurance. I would like to travel all the way, to do that I use this house of quality structure. Let us take a look at this structure here, I have got voice of the customer basically are the requirements. I have got requirements, which are put out here these are going to be determined after examining these requirements. And here is

something called the relationship matrix, I am going to be showing that when I show a filled out worksheet. And the interrelationships also is going to be something, that I am going to be showing to you.

The customer requirement priorities also is spell out here, that is like another part of the wall. Then on this side I do a comparison to existing product. So, I may have other cell phones that I can probably get samples of and I can use those cell phones, I can rate them against the requirements that I have discovered. I have discovered some requirements that the customers have spelled out as their requirements.

I could look at the competitions products, I could probably then do an evaluation of the competitions products, with respect to those requirement that I have figured out by talking to customers. Then of course, I come up with technical requirement priorities all these are going to be more detailed and they are going to a real example.

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Let us take one simple example. I am in the business, I am thinking going to business with a energy drink. And if you get close to the screen, you would be able to see the kind of properties or actual ways that the customers would like to have in an energy drink is good taste, nutrition, visual appeal of the container that is something. The customers would also like to see and good value for money that is like something that customers would like to see.

And to be able to that I find I have got to make sure for value, I have got to have good price for it, visual appeals size of it, not too big, not too small. Probably, something I can hold in my hand and nutrition that will be through calories and that will be probably a fat content and sodium so forth. And of course, taste is going to be controlled, again by mostly by sodium then of course, calories and fat of course.

These are going to be offered by my product designers. I have customer requirements on this side and these are going to be product features that my designers are going to be designing. And I also find out our priorities, I find that out by really finding out what is it that the customer wants. In the eyes of the customer something that is least important is visual appeal, something that is most important is good value, and something they would like see also is taste and nutrition.

If I offer these features with this kind priority, my customer is going to be happy. And of course, for us looking at the way we are going to be offering these features I am going to be working on price, size, calories, sodium and fat these are going to be my design component. And I do that by looking at the priorities that I put on all of these things and having done what I end up with is specifications for my product.

While I am doing this, I also do something else. I look at my competition, I look at their products, our design on the board is this. Our design on the board present design or present offering can be ranked as 3 out of 5. There 3 out of 5 on taste, 3 out of 5 on nutrition, 3 out of 5 on visual appeal and 4 out of 5 on good value. What is my completion doing? Competition is offering a better product in terms of taste, B is offering a far better product, the best in town on taste. But, competition is not doing so well on nutrition and B is equal to us.

Competition is going to be giving us a much better visual appeal, but, that is not so important for the customers. So, I may decide to stay with 3 and B also is offering something that looks better than ours. And of course, then I have got good value and there of course, we are at 4, B is at 4, A is at 3. With this I get an idea, how to reposition my current offering? And that I do that by perhaps I may like to go and match the best, that is in the market place. And I do that and I work that out, work out those details and I do that. And I end up now defining my product, my define, my product is now defined by doing this.

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Let us take a look at couple of other examples also. So, for building the house of quality which is that worksheet I identify customer requirements. I identify the technical requirements, I relate the customer requirements to technical requirements. Technical requirements are going to be design specification. These are requirements given by the customers, these are going to be design requirements. And then of course, I do valuation of competing products, to make sure I do not think too much and I really do not go overboard, in trying to offer a feature.

Then of course, I do technical requirements and develop the targets that I am going to be have to meet. These are going to be my own design target and of course, I make sure that I deploy this capability within my company. I have set my technical requirements not to deploy them within my company for doing that. What I do?

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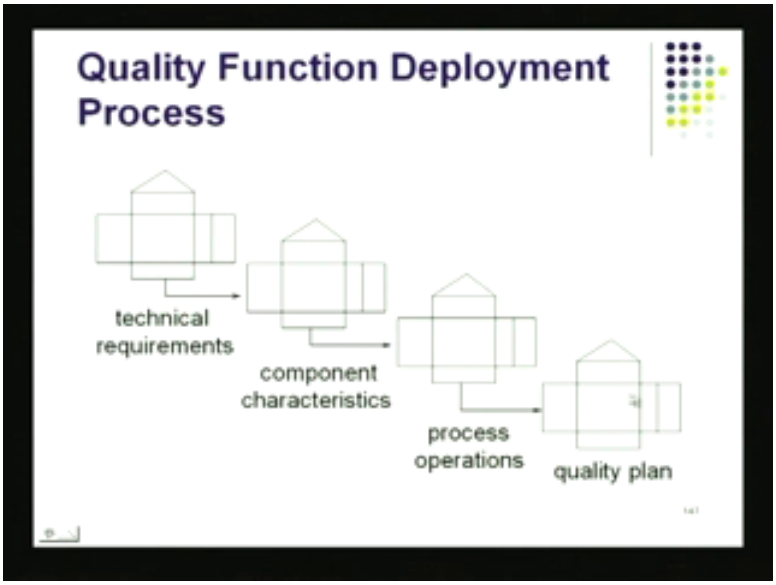

I do QFD inside. I did my first QFD, when I went from customer requirements to technical requirements. Technical requirements are my design requirements, from that I put down technical requirements as the requirements then I come up with component features. What are going to be the features of the of the component? The amount of salt, sugar, vinegar, whatever it is, you know that I put down here the shape of the bottle and shape of the can and all those things I have put down right there. I use those custom the component characteristics and I come up with process operations.

So, I have to create, if I have to fill a bottle, I will need a filling bottle, filling machine if I am going to be using a can, I will have to have a can filling and sealing machine, that is what I would be requiring. That I do in this step and after doing this I then move down to what I call the quality plan. Quality plan is basically the area where I convert my process operations into a quality plan. How am I going to be monitoring the fact, that my final product comes out to be acceptable to the customer this, what I would like to able to do. So, gone through these steps I have deployed my quality delivery capability.

The first was by doing my design, the second was by selecting the components and parts, third was by designing the process which will utilize these components and deliver the final product itself. And to monitor the process I also need a quality plan, I have done it all. And I have gone through these 4 steps. And in fact, in this way I will be able to deploy the capability, which is done right at the last stage.

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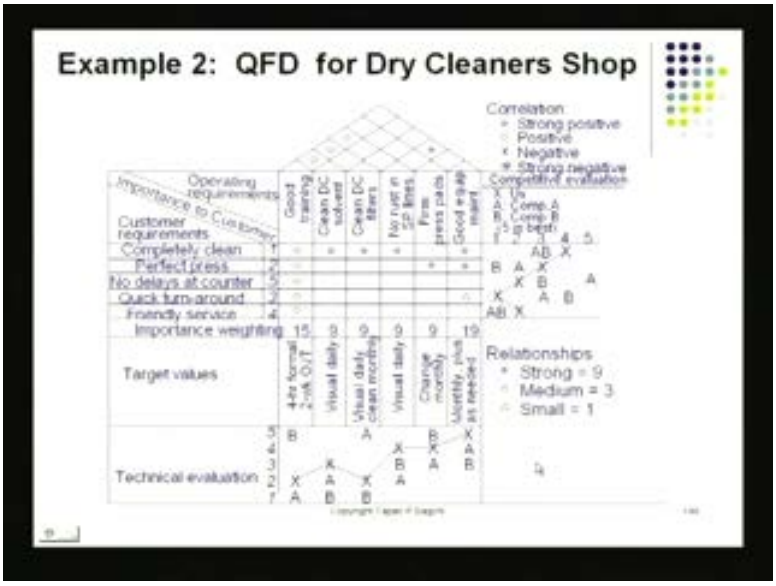

How I am going to be delivering, what I promised, what I ended up doing that, ended up doing in the QFD process? Let us take another, look at another example, someone is trying to setup a dry cleaner shop. And he knows that there are couple of dry cleaning shops already existing in that area there. And he then does a survey of customers and what does he find? Customers would like to have completely clean shirts or you know garments. They would like to have perfect press, they would like to have no delays at the counter, they would like to have quick turnaround may be a day, may be half a day, they would like to have friendly service, these are the things customers are looking for.

And the customers themselves give us importance and they say no delays at the counter. Completely clean is no delay at the counter is least important, completely clean is the top priority for them. Then of course, they would like to have perfect press and then of course, they would like to have quick turnaround and friendly service. And least of all they would like to have no delays at the counter, this is what they would like to have. These are customer requirements.

Then I get I my gang together. I get people who know this dry cleaning business and I bring in my workers and so on and supervisors and so on. You ask them, if you have deliver these things, what is it that you would like? They say well to be able to do that, we must have good training of our people, we must have clean dry cleaning fluid, we must have clean dry cleaning filters, we must have no rust in all the lines, that bring in

that fluid into the tank there, we must have firm press pressing pads. So, that I get good press and also I must have good equipment also. These are determined to be the requirements that now need to go into my shop. I am now beginning to design the shop and I come back with specifics. What kind of training do I require? 4 hour formal training and 2 weeks of on the job training that we think is really the minimum requirement to be able to do a job there and that is very important.

And of course, how am I going to keeping my fluid clean by doing visual inspection everyday, how am I going to be making sure that the filters are clean again by doing visual daily inspection. And I clean them monthly, this is like something that I pull out as a requirement. No rust in the lines, again I do visual inspection and the firm presses, firm pads on the presses, those I check by doing monthly checking and changing them by the month. Then of course, good equipment for that I have got to have some maintenance program in place.

How my competition is doing? So, I go out there and I get I send what we call a mystery shopper, he goes to my competition. And competition there two competition I have, I have competition A and competition B. And on the characteristics that I have put down there 1 2 3 4 5, I do a rating there. And I try to find out where does competition a stand in regard to us? One is always the best and two is (( )). So, it is kind of decide, where I should be and where competition is? This is my positioning, once I do that I give requirements to my company people. And after doing the technical evaluation, they kind of you know find a place where I should be, I should be in this position. So, when I go into business, in this business I got my technical requirements filled out there. So, what have I done here?

Let me tell you a little story. You know the Japanese they produced large amounts of steel and there are very few people who would like to just buy raw steel, they would like to buy finished products. And one of the products that been produced by using steel is ship hulls, a ship hulls, you know the large ocean liners. Now, this is something that Japanese started to produce. So, instead of you know selling raw steel they started to produce these ship hulls and they started to sell these ship hulls.

Then they found that people really had to do a lot of work to convert those ships hulls into finish ocean liners. So, what they then started doing was they said let us go into ship

building and there is a town in Japan called Kobe. Kobe had a big huge earthquake that is how they became kind of well known around the world. Kobe has a large ship yard but, they take steel, then they convert it to ship hulls and then they build these ocean liner.

What they found was, what the Japanese found was that if they offered the full finished ocean liner to a customer. To for example, a tourist tourism company or a country or a navy or something like that they came down and they look at the ship. Then they well we want to have another flow of fly put up there and we want some ladder here, we want that chimney to be moved somewhere else and so on and so forth. So, they wanted a lot of changes on the finished ship and that would cost the Japanese a lot of money. They said is there some way we could avoid this, they said if we involved the buyers right in the beginning by doing QFD.

By doing QFD, if I am going to involve the customers right in the beginning, then we could only select those design features that they would require and that is it. And we would not offer them any bills and whistles for which he is probably unwilling to pay. But, he does require certain things that I have never even found out, I never did QFD before this so, they started this QFD process right there.

And from that point on of course, their business started to boom and it was pretty clear. Right now auto features are also determined by QFD and there are many other products which are designed by QFD. It is also become quite popular in Japan.

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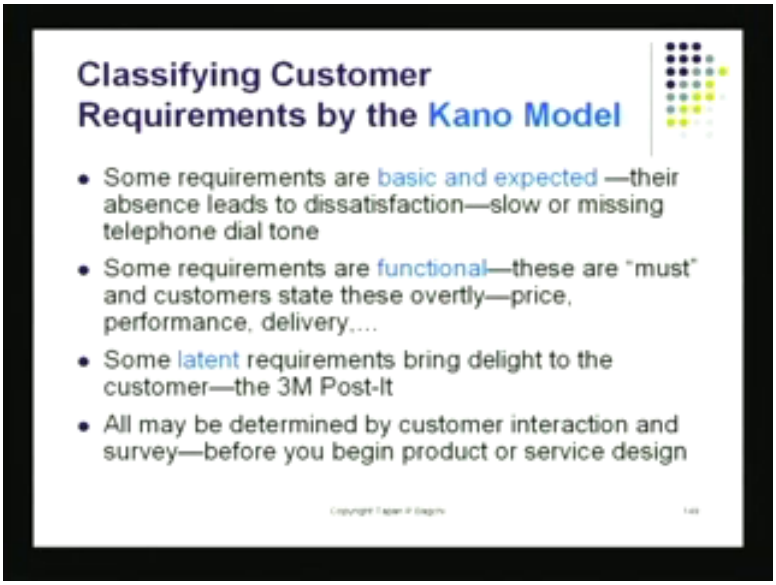

Now, something I have to also tell you that you know many features are offered in products, like for example, this cell phone there. Now you know the cell phone is also used sometimes as a radio. Now, that is fine, if I want to listen to a some message or some something like that, but, many young little kids they could buy an fm radio for probably the one tenth the price of the cell phone. But, they use this cell phone to listen the f m station, may be they do not want to carry another radio with them that is why they are probably doing this.

But, in the old days they used carry an walkman, they used carry a portable radio and that would do the job, they would carry a transistor. But, today this has become also a provider of music and also it is a provider of a camera, blah blah, lot of other features are there. How many of those features really are going to delight the customer, how many of those are really a must and how many of those are dissatisfies? In that if they are absent, the customer would be dissatisfied this was a big issue in product design. And I mentioned the name Ishikawa to you, Ishikawa was a Japanese expert. One of his students his name was Kano and Kano of course, later on became a professor also.

So, professor Kano he devised a method, he devised a procedure like QFD. And I am to show you, I am just going to give you just a glimpse of the Kano model. This is a model that helps you find couple of things for example, what are the basic requirements that I must meet in the final product, because these are the expected (( )) by the customer, these

are basic. Then of course, I have got functional requirement, this is why the person is purchasing the product. Then of course, there are certain latent requirements that he does not communicate to me, but, he is delighted by for example.

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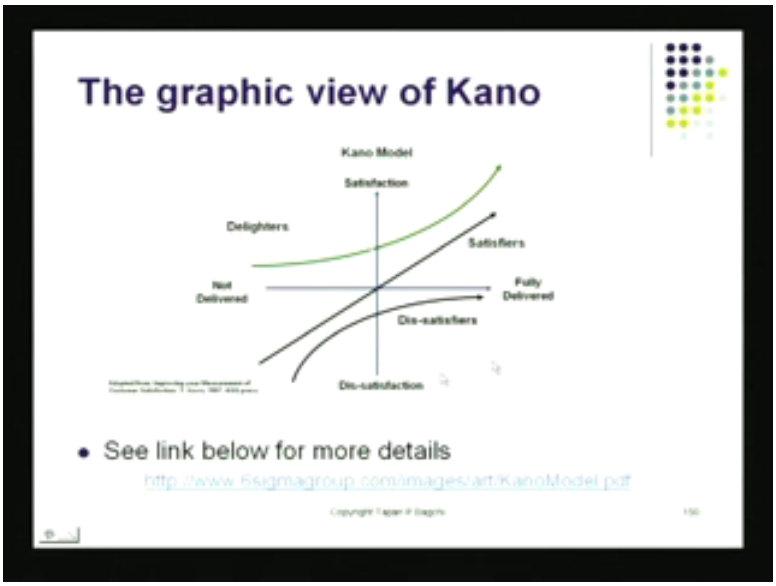

Let us take an example of how Kano represented the different types of satisfiers in a pictorial way? He found certain things which he called delighters, certain aspects of the finished product that became delighters. For example, when you send an s m s, does this keep a record of that s m s? I know many times you know we make a phone call we would like to retrieve you know some messages something there. Can I flip through back? And find out for example, what was the balance that my bank sent me in an s m s? That is going to be a feature, if it is not there it is not such a big deal, but, it is going to be delight me, there may be many others like that.

So, there are certain features which are going to be delighter and they are there. There are certain features that are going to be satisfiers, if they are absent I get dissatisfied. For example, a cell phone for example, you know one of the satisfiers is remember the last dialed number or remember the person they will recall the number. That made call to this place to this particular cell phone, these are going to be a satisfier, these are going to be things, if they are not there it is an inconvenience. So, I kind of judge it that way. So, Kano called these not delighters, but, satisfier.

Then of course, you know he had dissatisfier, certain things if they were absent there, it would be dissatisfier. For example, you know what we got here? we got a plastic cover for this. Could something be done by which dust would not get into these keyboards here because, many times some people do not want to have the cover their. I personally do not mind having the cover their, if that initially if this was not so good because even I could not press on the keys properly with the help of a when the cover was also there. But, could something be done, that could probably protect it from dust, For example, or protect it from scratch, could that be scratch resistant. Those are the kind of things, you know they are not their it is not such a big deal, but, if their absence really annoyed it really bugs me and that kind of thing.

So, Kanavos was able to classify now all the different requirements. You notice when we are talking to customers to try to get our QFD done build the house of quality. We talk to them or we try to find out example. For example, what are the things that people wanted? So, they wanted completely clean shirt, they wanted perfect press no delays at the counter quick turnaround and friendly service. I am pretty sure if you looked a little deep into this with a Kano model, we will probably say, completely clean is something that we definitely would like to have.

Friendly service might delight me, no delays at the counter not such a big deal, but, perfect press I must have it quick turnaround if it is delayed then I am not satisfied and so on. So, I could reclassify these things not in terms of priorities. But, in terms of the Kano language of delighters basic requirements and dissatisfiers, I could do that, functional requirements and so on. So, again I will ask you, I will alert you to look a little deeper into this, if you are going be in this business, if you are going to be designing products, if you are going to be offering services to take a look at this.

I provide you again I provide you if you are again with a little website and look up that website. And going there you will be able to find lot of tips there which basically talks about not just a QFD model, but, also the Kano model and give you a lot of things.

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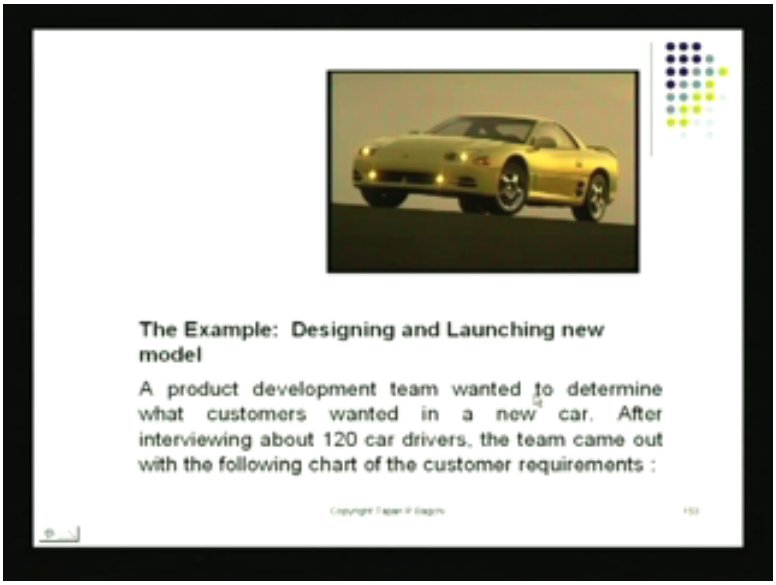

And this can be done I have given you another example, there and this example is coming from a guy who is going to be launching a new car, this example is for a new car launch. Now before, obviously, one goes into a big venture like for example, offering a new car, what you would like to be able to do is you would like to for example, find out what kind of people there are, what is their driving habits and so on.

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So, he kind of you know viewed the whole world to be a uniform market there. And with that he did his survey and he put down his questions and he found certain things, he

found these requirements. But, what he did not do was? He did no really classify people (()) in any way, he did not set a market. And he just wanted to see what is it that people wanted to see people generally wanted see in a car. So, people gave them gave this company these requirements, the car should be easy to drive, quiet riding and excellent finish, smooth riding even on rough road, excellent gas mileage, aerodynamic design, hugs the road, free from breakdowns, fast acceleration so on. So, but, you know 12 15 items were listed out and in some order of ranking these were listed out.

So, the company thought it had done the job because, it found these factors by talking to customers they went and did some survey you know floated some questionnaires. And they did a large enough survey and they were able to find that these were the ones and they also got the ranks of them.

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They went into a development of the thing, the problem was this they realized and they realized this a little later that there are two types of drivers on you know on the road. There are certain people who are like sports drivers, they are performance drivers. They would like to have the car really you know go up and down and all do all these wiggly things and so on so forth. There are other people who are commuters they are practical drivers. May be commuters and housewives, may be they are carrying children in their car, they are not they do not want the features of a sports car in their car. But, suppose a fellow really wants a sports car, would he like a back seat, would he like a huge trunk?

He probably does not need any of those things. He would like probably two or may be one seat only that is all may be only that is all he requires. So, really you got different requirements.

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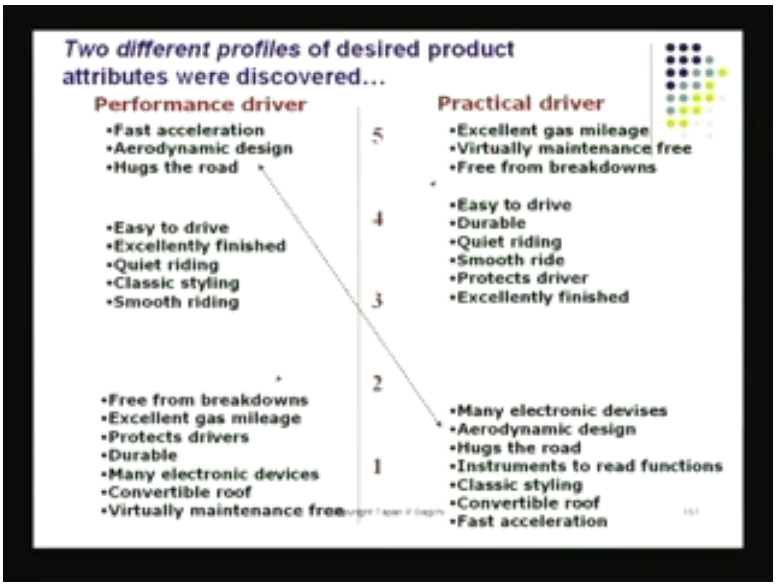

What they were able to do is this company went into the, this business and they quickly sorted. Quickly sorted the different needs that they found of the two types of drivers they were performance drivers and they were practical drivers. What these performance drivers rank high? Was fast acceleration, aerodynamic design, hugs the road. The next class of classification they give us is easy to drive, excellent finish, quiet riding, classic styles and smooth riding.

And something that was least important to the performance driver these were sports car, drivers were free from breakdowns, excellent gas mileage. They could be bothered because, they all had gas guzzlers in their garage, it protects the drivers they really care about that either. They also did not want durability, they also want any of the electronic devices and so on so forth. And they did not, obviously, wanted a convertible roof because, that might crush the driver in case the car flipped over.

And they really bother about being totally maintenance free on the practical driver on the other hand. Wanted excellent gas mileage quite opposite to what the performance drivers wanted. And they wanted it to be virtually maintenance free. Practical drivers they wanted it to be free from breakdowns again quite opposite to what these guys wanted.

They obviously, wanted it to be easy to drive durable and so on. Notice some of these things they are common, these things are common because, these are basic needs these are functional basic functional needs.

And of course, things that practical drivers also wanted was, many electronic devices, aerodynamic design, hugs a road and so on so forth. Notice here many electronic drivers, many electronic devices, were preferred by neither of the groups. So, In fact, I need not really provide a lot of electronic devices in a vehicle and it is not necessary. People do not walk in to a car to have a good time, just stand in one place and you just have good time, you know lot of rock and roll and so on. They do not really want that experience while they are sitting in a car. May be if your car is stalled in traffic, you would like to do that, but, how often do you are you stuck in traffic or something like that.

So, in fact, the message is this by doing the QFD. By doing the QFD process, you discover things that are neither liked by the special group which is like a performance drivers or the practical group which is the commuters and housewives. For example, certain things none of them would like to have convertible, nobody wanted convertible roof.

So, in fact, the message was that design a car that should look probably something like this. And this is what they went in with and they; obviously, came up with certain things. They also recognized in this case that there were two segments in the market place. And they obviously, follow it through for each of those cars, they followed it through with the proper stage by stage QFD. They were started with the top the design of the process, they came down to from design, they came down to components, they came down to the manufacturing process. Then they came down to quality assurance, they did that.

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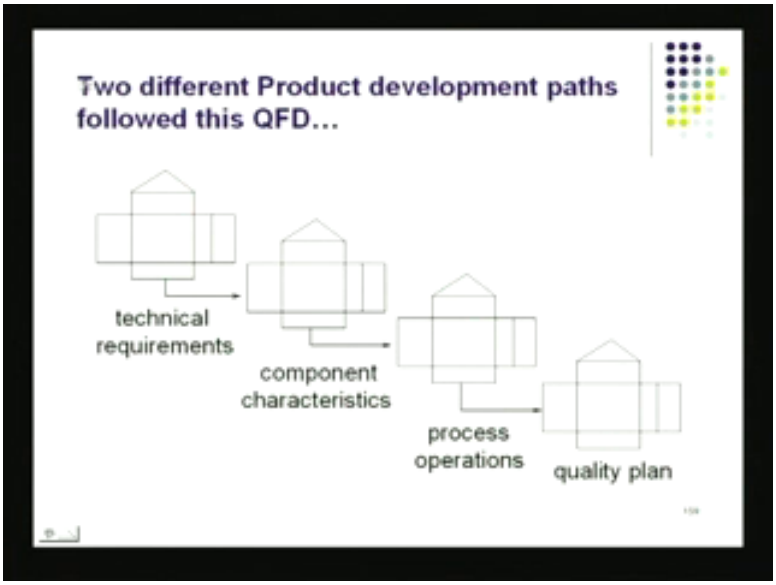

And that is what is really shown there by showing requirements, component requirements, the process operations and the quality plan. That is how they ended up by doing this.

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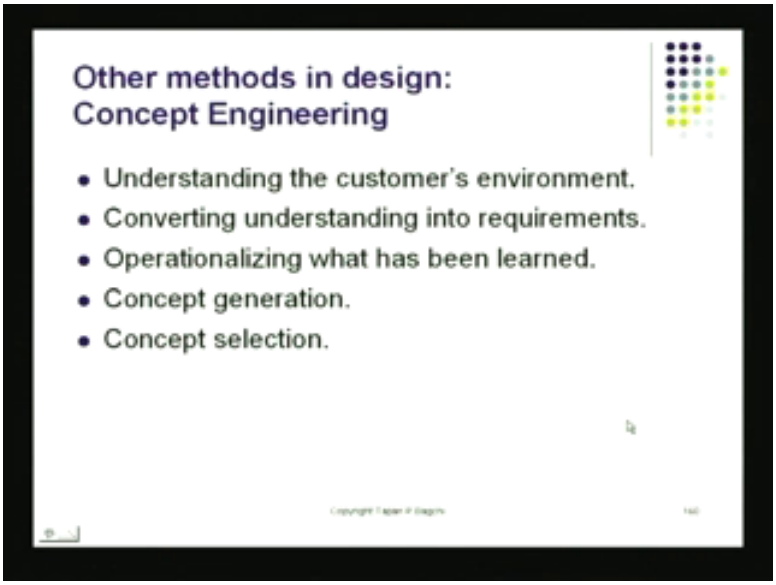

There are other methods for improving your design, there is one area that is getting more and more important, that is called concept engineering. And here you interface with the customer in a very special way.

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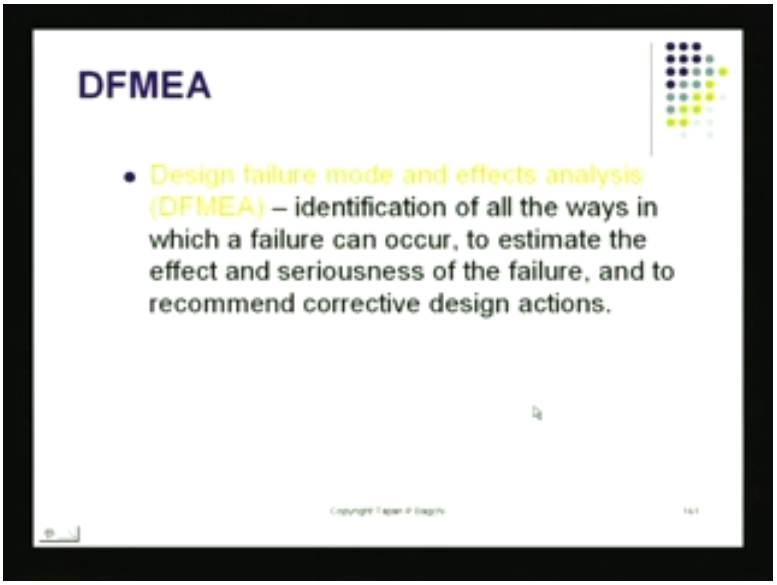

There is something where you also try to take a look at the breakdowns possible in a design with a with a finished product. And they will give a special method apply a special technique called D F M E A. F M E A is a standard engineering method by which you try to predict failures that can occur and you try to take preventive steps.

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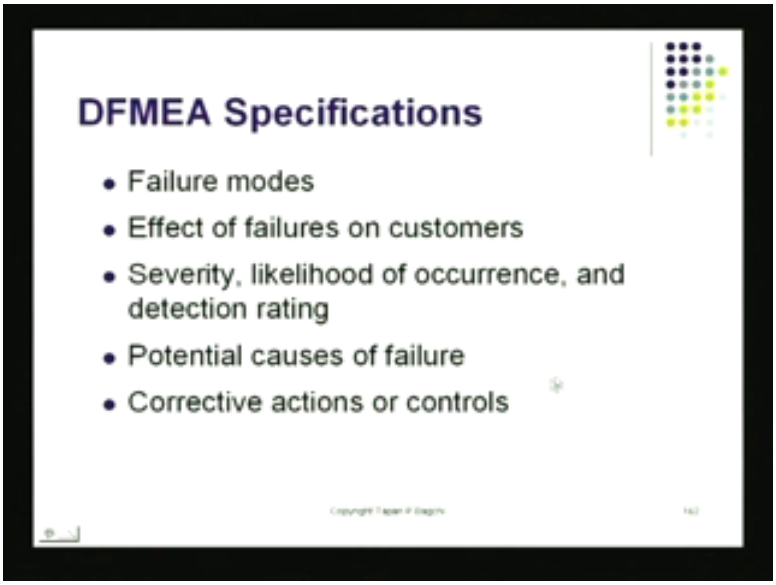

So, that this failure does not really take place, that is something that you would like to do. D F M E A come ups design failure, mode analysis. This is actually comes up with failure modes, the effects of the failures, the severity or the likelihood of the occurrences

and the potential causes of the failure and corrective action. These are the kind of things that you would do at the design stage before you start your real design.

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There are some of the other tools also available and there are the basic tools. 7 basic tools you have already seen, there are certain other tools they are called seven management and planning tools.

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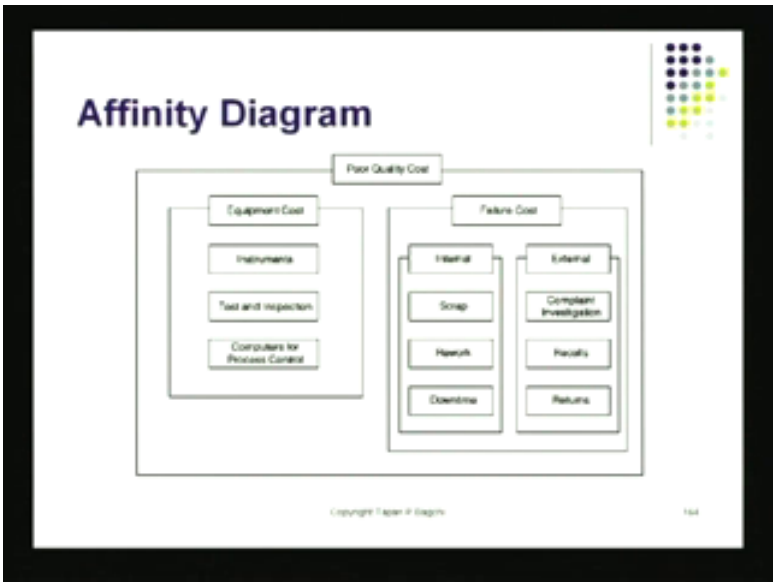

I am just going to give you glimpse of these. There is the affinity diagram, then there is the interrelation diagram, digraph actually, that essentially gives you the flow of the

decisions as they move through. Then there is something called the tree diagram that helps you organize a lot of information that is there. And the Japanese use this a lot when they do, when they are playing with different concepts.

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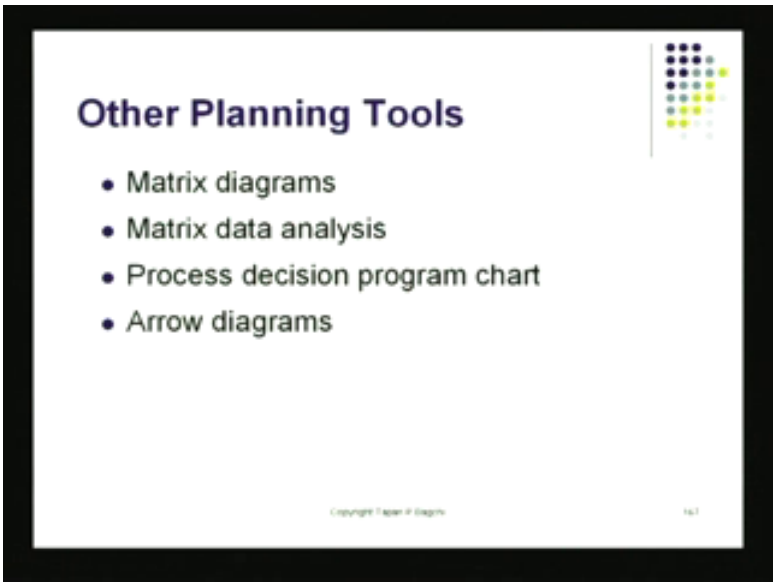

And there are other planning tools. Some of the other planning tools are like a matrix diagram or the matrix data analysis diagram.

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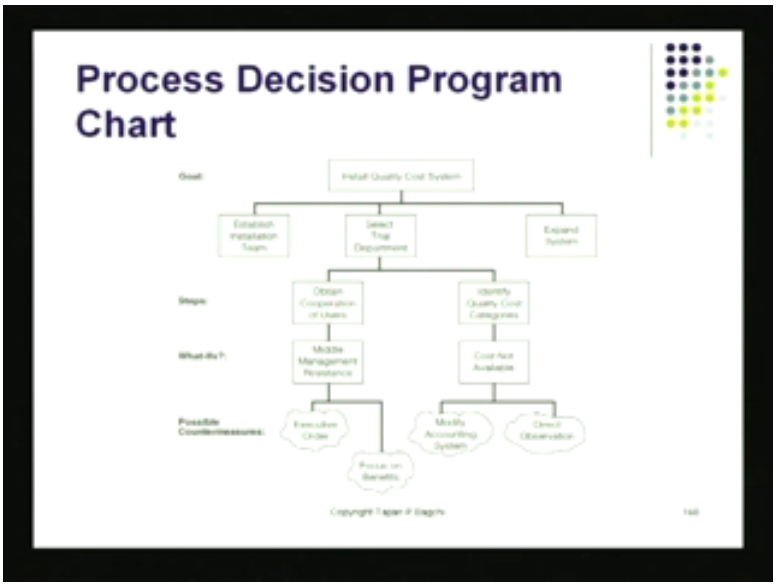

And then of course, you got process decision flow chart and then you got arrow diagram. These are also utilized many times, when doing some sophisticated design you go

through these things. And these are all real, shall I say devices which are utilized by people to come up with a good design.

Like I told you right from the beginning two-third of quality problems in a finished product those can be traced to the design of the final product. And design not just the design of the product itself, but, also the process that you manufacture this. And the quality assurance system that is there to monitor the process to try to come up with the final product there.

This would be true for almost anything that I come up with any product you are looking at many of the product defects can be traced to designs. If the design is defective two out of three times you will end up with a problem with it. And then if there are going to be custom complaints and there could be external failures, there could be likably suits there. And of course, if your process is not good enough, if you not really optimized the process you will end up with a lot of internal loses.

And you will probably have lot of money spent on inspection, you can prevent all of these things. If you do preventive things, which are things like training, use of proper design guidelines and use of the tools that are mentioned here and do not forget Deming's 14 points. Those are really crucial in order of for us to be able to do this. One of the things these quality experts have emphasized was the use of data. And that really requires you to start thinking somewhat like a statistician. Make sure that all your actions they are driven they are data based.

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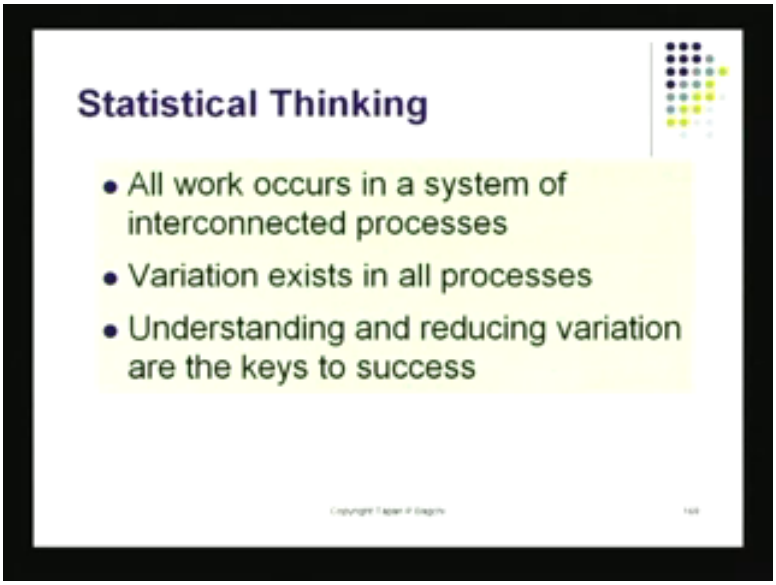

So, here is an example, all work occurs in your system of interconnected processes, variation exists in all processes, no matter what you do you are not controlling all the processes, all the factors. Therefore, there will be variation. Understanding and reducing variation this is the key to success is very very important for us to realize.

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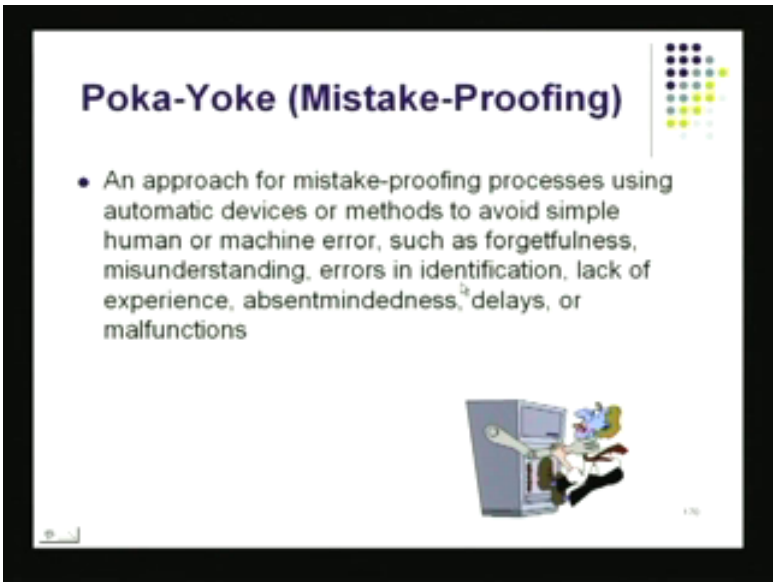

There is another set of tools. Tools are not just a few, there are another set of tools. And one set of tools these were created by the Japanese this is, these are called mistake proofing. By which you basically try to sort of avoid problems, when due to lack of

experience or errors in identifying something or reading a sign, absentmindedness or something you end up with a problem there.

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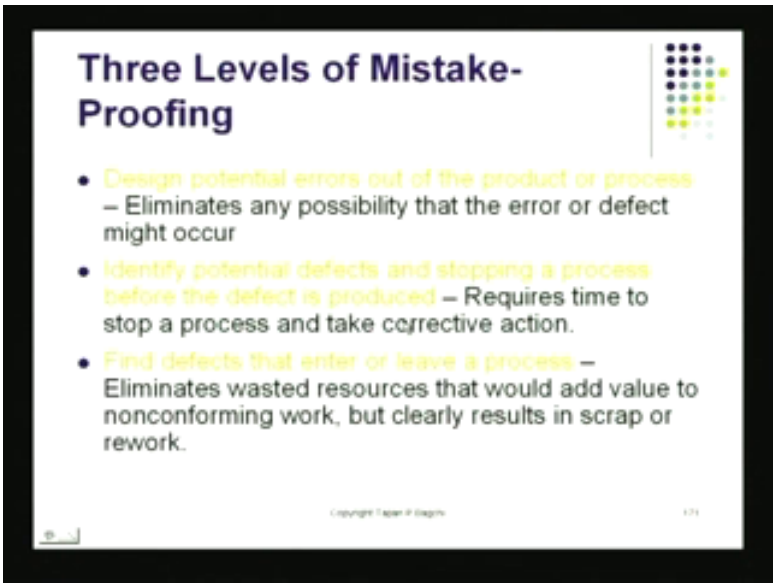

Let us take look at some of these things. I can design against a lot of these things by doing what we call mistake proof designs. How do we do that? Let me guide directly take you to examples.

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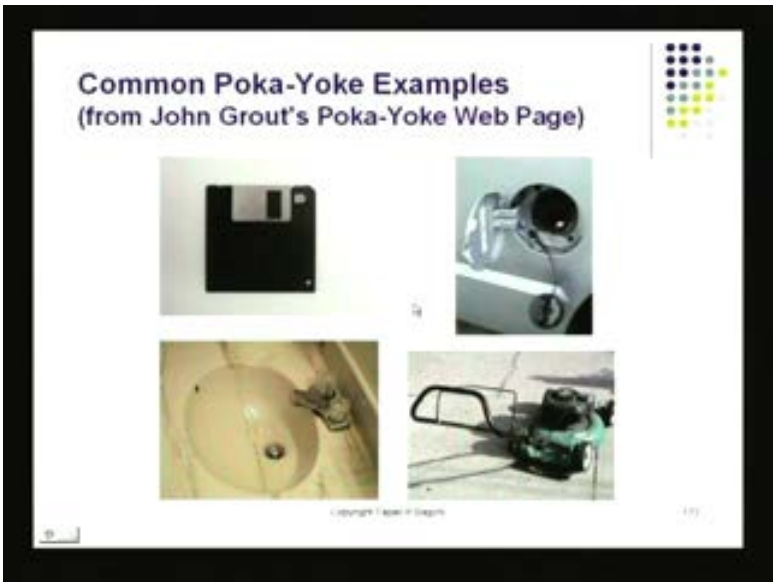

You all remember this small floppy disk which was there, we do not use floppy disk much anymore. Because, we are all using our new friends, our cds, using cds also using

what we call those little drives, the little drives there those are all now used in place of the floppy drives. But, let us say that I am using floppy drives. So, I come back to the screen again, this floppy drive is there. You know there is a magnetic material inside and that requires protection from dust.

This dust cover has been designed using poka-yoke. Even if you are not mindful if you do not shut the window down, if we do not shut the, if we do not cover the thing properly, dust is going to be there that is going to be damaging a media and the data and so on so forth. So, that is something you could avoid quite easily by having this. So, this design has been done this sliding window. It has been done it automatically opens when you slide it inside, inside the p c the drive and it comes back when you take it out. So, it protects you from dust at the same time let us you give use your data.

Look at this lawn mower, notice this bar when you cut grass using this lawn mower. You are supposed to not just manage the handle bar but, also you are supposed to take the pull this bar. And you know grip it like this, you are gripping two things together, you got the handle bar. And of course, you got alongside the handle bar you got this bar also and you grip the two together and you hold it like this as you are cutting grass.

What it really does if you release the bar if you release the bar either it will stop the engine or you stop the movement of the thing so it is a safety thing. See if you let the vehicle go just like that if you let the lawn mower run just like that, it is very possible may be your you know foot will get caught or something or it will probably run over something that you would like you would not like it to run over. And that can happen if you are trying to control it with one hand. What you are really supposed to do when you are riding a lawn mower or when you are driving a, we you are cutting a grass with the lawn mower? Is grip the two together, if you do that, if you grab the outer bar and the inner bar together that is the safest position.

Look at this cover here, many of you recognize this is the cap of your gas tank. You go out to fill some petrol in your car, many times we misplace this can or the, this cap. We misplace we put it on top of the car or on a on a roof of the car or someplace and then we drive off. And my god you know it has happened to me. It happened on Vermont I had gone to this far away gas station, it really was really big struggle to try to find this gas station, I was almost like empty I was going there, but, then I located this place then I

went there then I was mad rush to get back to normal ground again. I had up come up on this camp ground and there was this gas station there, I wanted to return from there to where ever we were staying.

And I, obviously, I uncapped this thing, I took some gas and I forgot to put the cap there, cap was left on the body of the car, I drove off. And somebody told me, you know it looks like there is some gas spilling from you are, the moment you break there is some little splash of some liquid out of this thing. I oh my god I think the cap is not on, I stopped the car I take a look at it oh was sure that the cap was not there. I had to drive very carefully to make sure, I reached a gas station, I got something there. They could make sure that you know no gas would spill out and so on, then I got a gas cap there.

So, now this little string there has made it poka-yoke full proof even a fool like me would not really be missing this cap. And same thing what happened with a basin and so on, so forth. It is very very easy for you walk in there, you of course, have this thing. And this thing will leak water, I mean if you, if I am mindless if you just leave the faucets open it will leak water. But, the full proof way is in place of doing this put a electronic control there.

So, the moment your hand you are washing your hand water comes up and water comes out the spout is on and you wash your hand. So, you do away with this sort of a thing you put an electronic sensor there that will notice the position of your hand. It will bring out water only when your hand is there, otherwise it does not bring out anything there.

So, you conserve gas, you conserve gas is to heat your water. And also you conserve plain water itself because, it is not pouring when you are not when your hand is not there.

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So, that is like another poka-yoke story. There are many other poka-yoke stories, there is something called kaizen blitz, this is like a (( )) type of situation when you go out. You say that let us get improvement done. And for that what you do? Is you put in an intense effort, you go through rapid improvement process these are like these are like a campaign a short duration campaign through which you try to accomplish a lot of things. These could be done like you know Saturday mornings or times like that when you got a lot of clutter around you want to put things in order. You get this gang together, you say let us go on a on this blitz, let us get this turn, then we will go and have some pizza that is what we will do. That is like one gateway to get a lot of things done in a concentrated mode.

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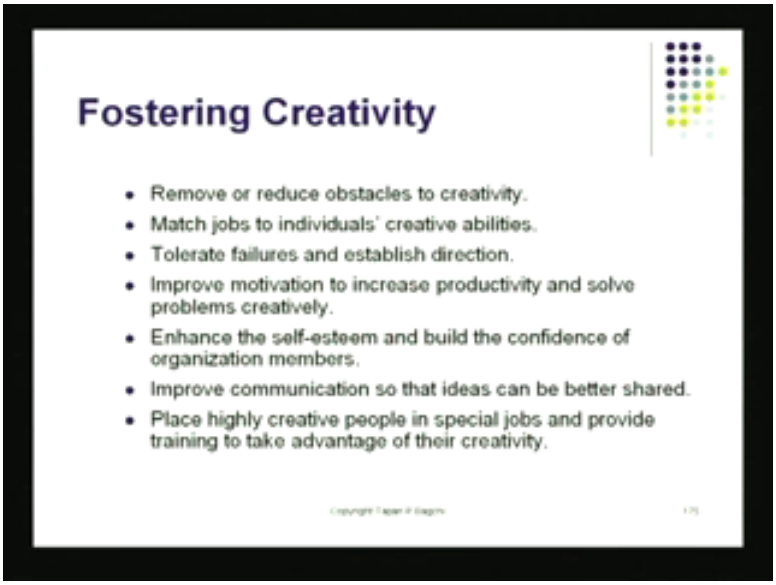

Creativity and innovation these are also part and parcel of solving problems there. There are many tools which are available now that foster creativity. And there are some facilitators they are really like good really good in promoting creativity that is something that you should also take a look at. Some words of wisdom from Texas instrument, this a company that is been very successful and then they you know brought out product after product. I am not really sure Nokia what kind of chip they have inside, but, they will probably have some chip, some place something will be made out of Texas instruments. These guys have been in business for a long time. If you go to Dallas, you will see their massive operation there.

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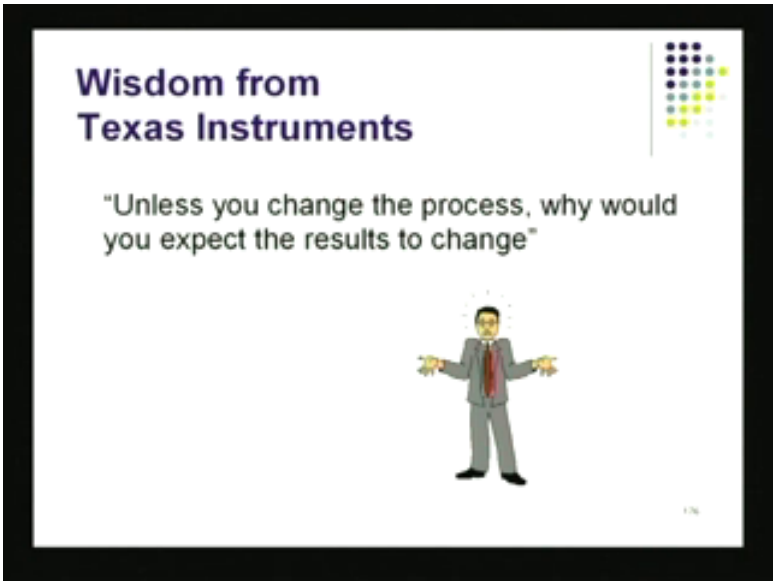

Their mantra is this, unless you change the process, why would you expect the results to change? You want the results to change because, your customer is not satisfied. He is not happy or he is going somewhere else. What is it that you have to do? you want to obviously, change the results. So, that his experience is different, but, how I do that without changing the process that is not possible. So, Texas instrument people are saying unless you change the process, why would you expect the results to change that is like a Texas instrument mantra.

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Now, we move into a slightly different area we go into quality system certification and I am going to be breezing through this. And I am going to be doing a bit of rapid-fire in certain places because, most of you can probably find a guideline.

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So, I am going to be giving you the highlights of ISO 9000 also that of 14000 and Q S 9000. The ISO 9000 system came along when Europeans wanted to do trading with each other. The French had their own quality assurance system, the Germans had their own and the British they had their own and Scandinavia's they had their own, the Italians had their own. And because, they all are they all intent on satisfying their domestic customers they never really bothered about trying to change their quality system, it was fine. The British standard was fine, the German standard was fine for their own domestic purposes.

But, once they started to you know when the union was formed they wanted to do trade with each other to expand their economies. They said good to make sure when we talk quality we can use each others parts, when you got to assemble something, it is not that the British are going to perish the final finished product. what ever it would be, a real load engine or something like that or the Germans (( )) produced the finished vehicle completely or the Italians would produce or the French would produce the finished furniture completely, nothing would be left to be done by somebody else. They said in this mode of creating with each other, we should be just specializing it doing whatever we do the best.

So, may be the French would produce a lot of wine and the Italians they will produce a lot of artistic chairs and so on. The Germans would be producing machine tools and everybody has needs for those things. I am sure the Germans drink wine and the Italians also you probably, you have some use of German machinery and so on. So, they would be doing some trading, they wanted to have one system and that one system became the ISO 9000 systems. So, they formed a technical committee in 1987 and the laws that and now of course, 100 different companies they are using ISO 9000.

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It is a system that really is dependent on certification. That means, there is a set of auditors who come around and look at the operations.

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They make sure your practices confirm to whatever the ISO 9000 series of standard spells out. As whatever it spells out as standard practices and they make sure you practices confirm to the standards.

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How was the technical committee formed? They were initially, they were local committees then they were national bodies. And the national bodies came together they contributed members into this technical committee, TC 176 was the committee that led to the ISO 9000 drafting.

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And that was drafted in 1987 and it became a standard, that was international. It would promote trade and cooperation, that was really the trust.

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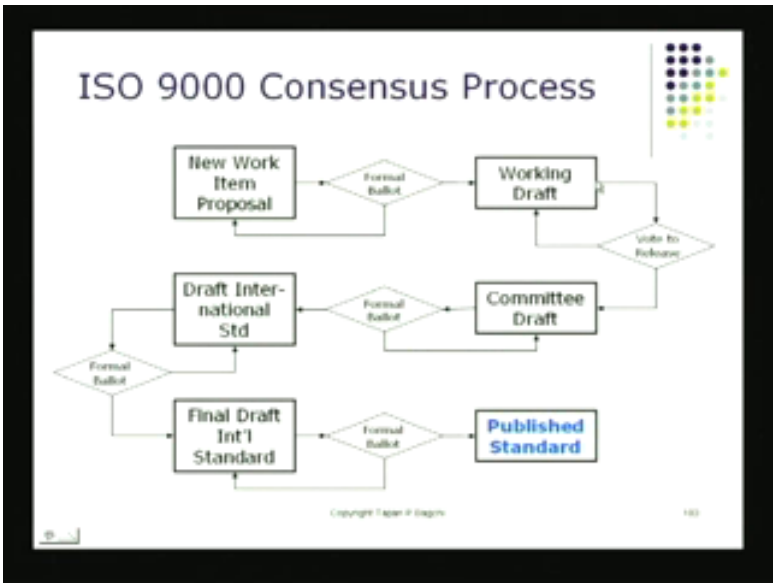

And there is a particular process through which the reach consensus, this is a systematic process by which the reach consensus. So, they started with a working draft and they came up with a committee draft and they reviewed the draft and so on so forth they came up with the published standard, that was then broadcast worldwide.

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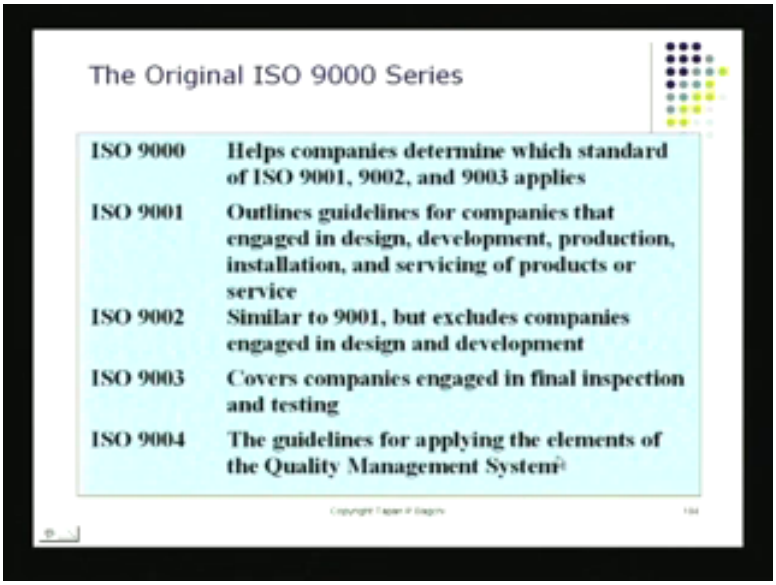

Initially, there were like 5 different standards given. Later on of course, they realized that the 5 different standards, they were really you know, getting into a lot of bureaucrat, bureaucratic procedures so, this simplified that later on. And one standard was put together that was for care of the environment that was ISO 14000. And ISO 14000 also lived along nicely. Then there was ISO 10011 which was used for, was used for quality systems auditing guide. And there was another one that was a manual development guide, you had to produce some manual.

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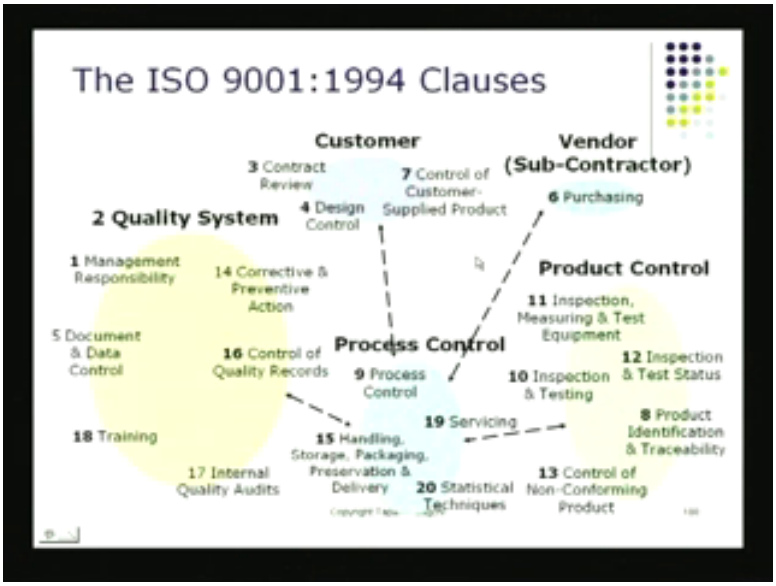

In 1994, ISO 9000 was combined and one version came along that had 20 different clauses, 20 different aspects that were audited. And guidelines had to be prepared for all these 20 line, 20 different clauses, each of these 20 20 different clauses and then they came up with requirement for each of these things. And the auditors use these guides actually these standards to audit a regular procedure, to make sure that the procedure was there.

Their vision in 2000 was, that they would unify these standard and they come up with standard, which they did when they came up with ISO 9001 dot colon 2000. This was a new quality management system that was out together having learnt a lot of things that was done with the initial set of four or 5 different standards. They came up with one standard, which is this one now, which put a structure in whatever a company does. And it wanted to make sure management put someone in charge. Wanted to make sure, resource management was there. And product realizations so, it wanted to make sure design was done right. And measurement and analysis and improvement, these were also built in into the quality management standard ISO 9001, this was actually not there in the initial one.

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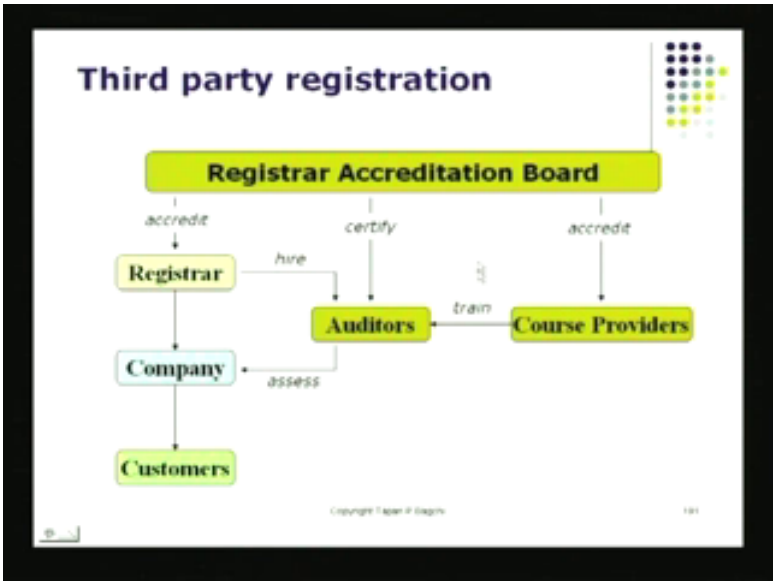

The registration was done through some people who were accredited to be registrars. and these registrars actually they were authorized to conduct these audits and they went through certain steps.

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And they reviewed the process they reviewed certain steps and then only they would issue the registration certificate. That was done and the registration process itself, you can again read the details there. They tell you they walk you through a few specific steps that will need to the registration process.

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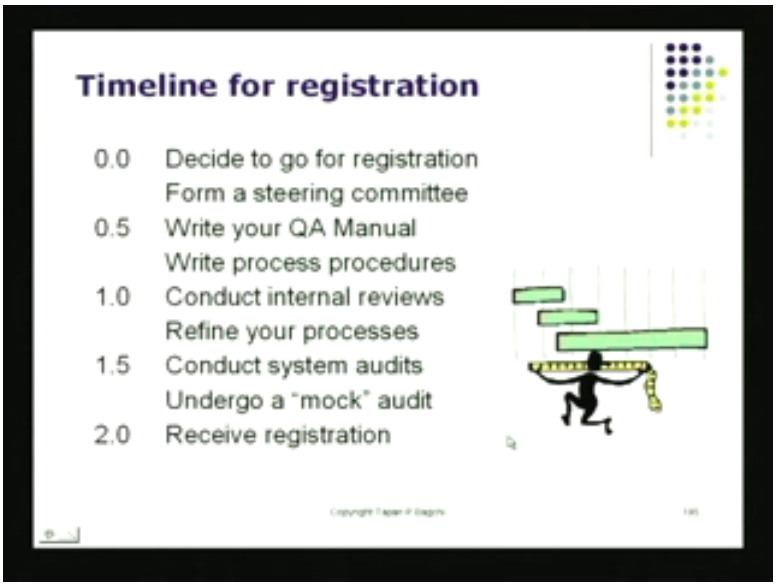

There is a plan for it there is a formal plan (( )) you decide to go for registration. You write your Q A manual, you have internal reviews to make sure, you are doing what you wrote down and you are wrote down what you are, what you really are to be doing. Then

of course, you do a systems audit, you do a mock audit internally then you go out and get the registration audit done and you get your registration.

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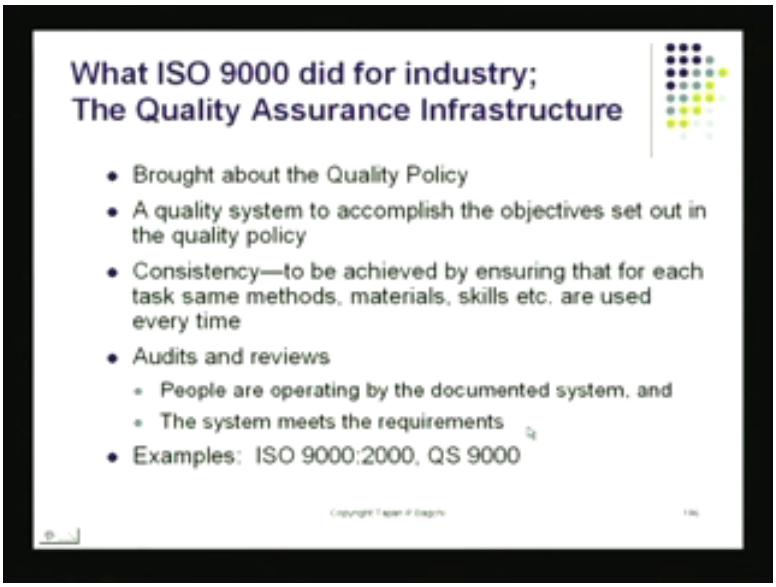

And what did you do for industry? It brought about the quality policy. I can tell you for sure, my own experience is, when people were talking to me because, they wanted to get accreditation certification. Many had no idea that they wanted to they had to spell out a quality policy for the company. How they wanted to delight the customer or what they really interested in delighting the customer, what they really interested in just making money or making maximizing their profit, what exactly was there reason for existing in business, that had to be spelled out?

Then of course, a quality system had to be there to make sure that they achieve the objectives that are set out in the quality policy, they wanted to have consistency. And consistency was achieved as a result of ISO 9000 accreditation. Then audits and reviews these also became common after ISO 9000. And the perhaps, the biggest contribution that ISO 9000 made was it led to a new standard for the automotive people called the Q S 9000. And I am going to be giving you a glimpse of that.

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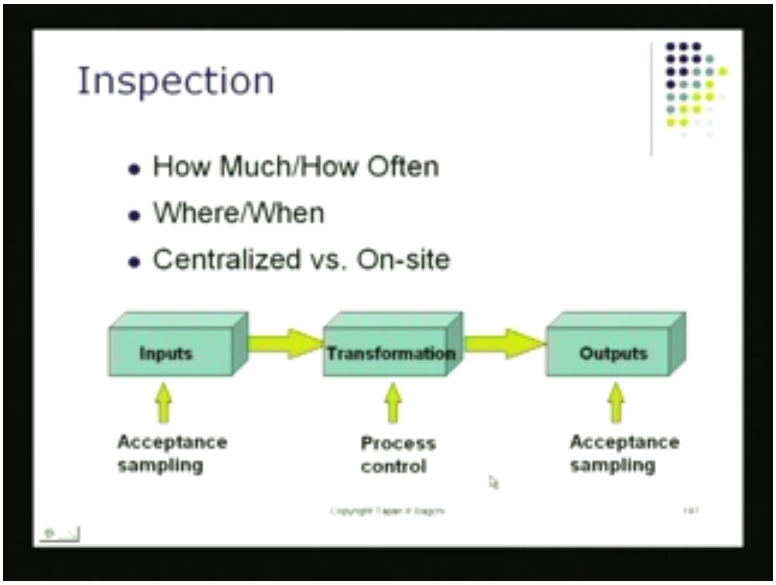

And here is one example of what ISO 9000 spells out, inspection the task as you know it is carried out by spelling out. You know, how much you have to inspect, how often you have to inspect, where you have to inspect and blah blah, these things are there.

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And ISO 9000 really says that these are the places you have to be doing your inspection.

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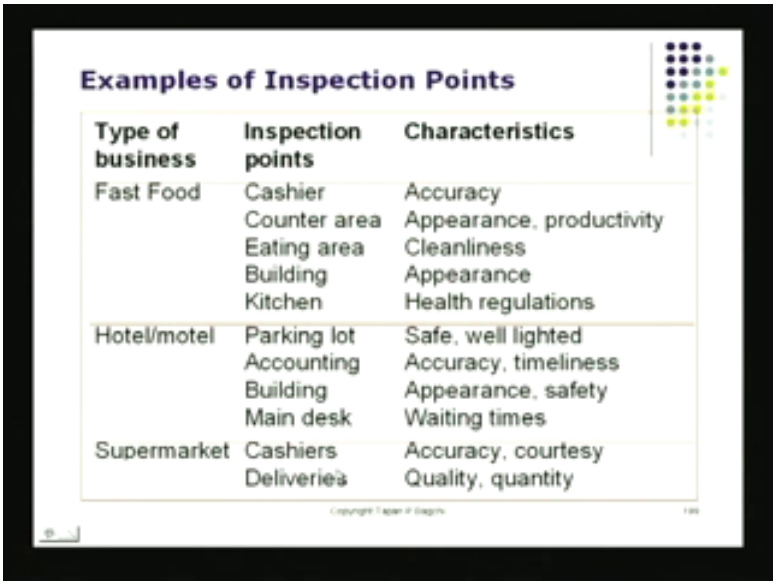

And let us take a look at one particular situation. If it is a fast business, the inspection point should be cashier. And what you should be doing there is? Inspect for accuracy, counter area appearance and productivity, eating area cleanliness, building appearance, kitchen health regulation, these would be the targets of your inspection, if you are in the fast food business. If you are in the hotel or motel business, parking lot is it safe, is it well lit.

What about accounting? Do you have accuracy, do you have timeliness timely processing of your bills and so on. Building appearance and safety that is very important. Main desk waiting time, these would be again things that you should be inspecting. These would be the things that then the ISO 9000 possible probably say, are you doing these things, what are your standards here, and show me some evidence that you are doing it. A supermarket couple of things, there cashiers they check for accuracy and courtesy of course, and deliveries quality and quantity, these are the things that a supermarket should be doing it is inspection also.

Here is like something this is some guideline that we got in from ISO 9000. Once these become standard practice of course, and then your process runs very well.

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You are supposed to do the surveillance audit to make sure the things stay the way they are. There are certain international issues in regard to ISO 9000 that are also there. And I should also tell you, that it led to this other standard called QS 9000. QS 9000 basically came along because, the big auto makers in Detroit, Chrysler, Ford in general motor, what they found was that this the basic ISO 9000 was not doing good enough because, they did not really impact the quality of the final product. It did not really go out and look at the final product saying that I assure the quality of the final product just because, I have ISO 9000. ISO 9000 was not doing that.

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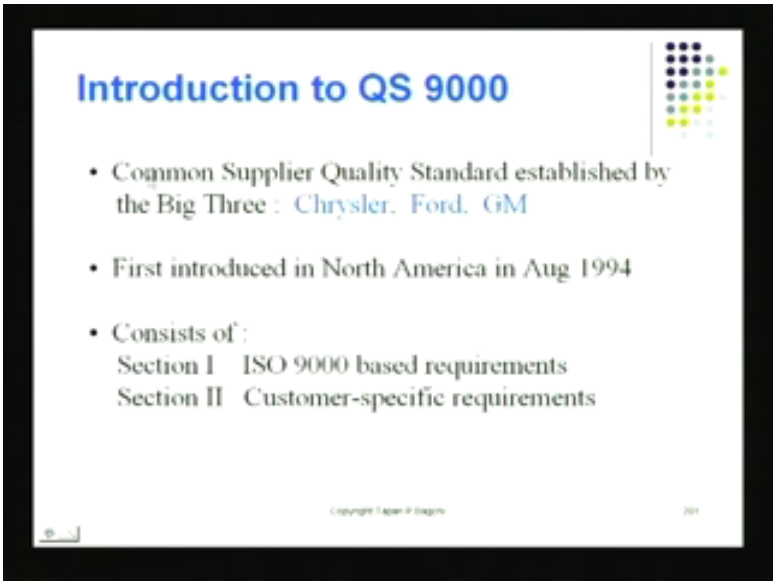

So, then these people G M Chrysler and Ford they got together and they coined this new standard called G S 9000. They built it on the foundation of ISO 9000 and then they added additional customer specific requirements to it.

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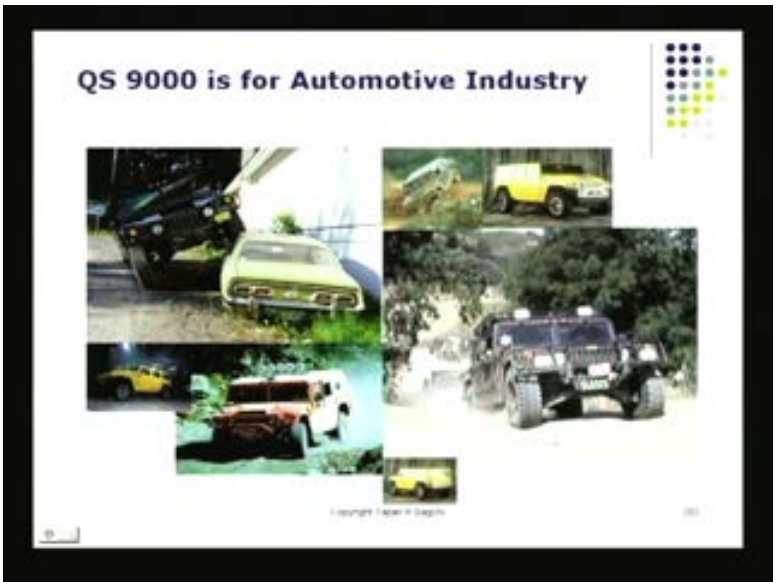

And the result was autos not only autos, but, also auto parts manufacturers they had to confirm to the QS 9000.

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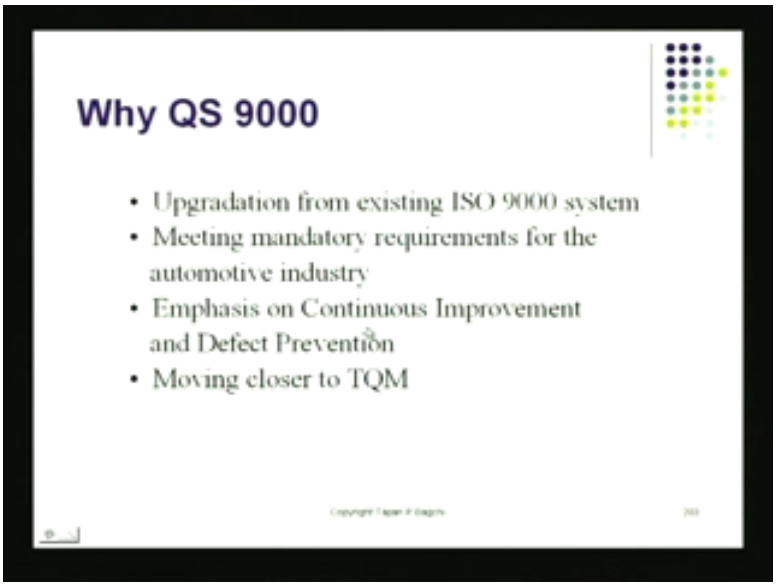

So, the QS 9000 is built on existing ISO 9000 system plus it adds certain mandatory additional requirements. And it also emphasizes continuous improvement that it borrows

from TQM and it moves the whole thing more toward TQM. Mind you, when I talked ISO 9000 I did not mention TQM. Of course, I did not mention anywhere, I did not mention six sigma, I also did not mention SPC these were not required in ISO 9000. And these were found to be highly wanting by these auto manufacturers G M Chrysler and Ford. So, they wanted to make sure that these things were there because these were their big headaches. They just did not want a manual they did not want a quality policy and so on. They wanted good nice finished cars that are what they wanted that is what they wanted to deliver.

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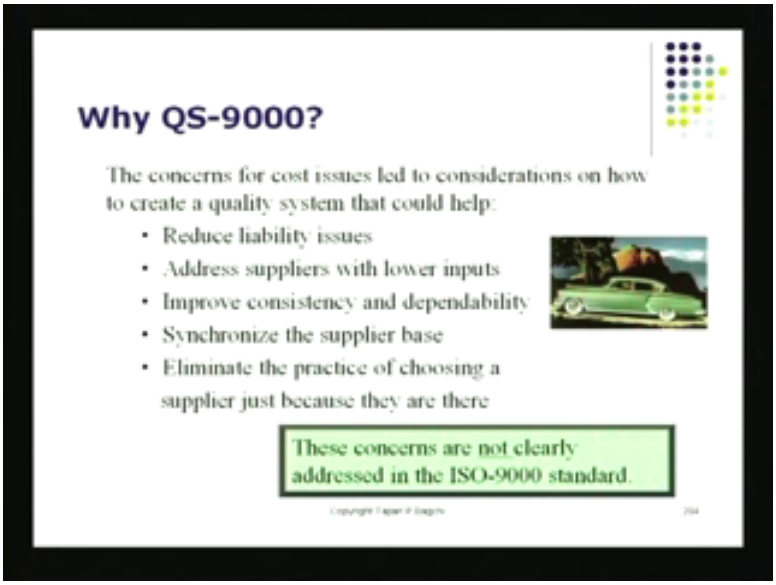

So, they coined this and they designed this total new way of looking at quality they coined it QS 9000 these have many different requirements.

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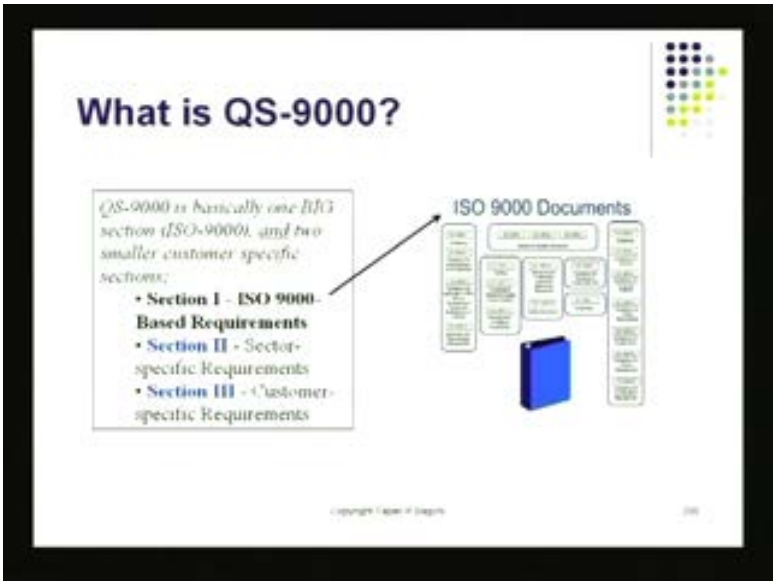

So, they have the basic requirements. Then they have certain sector specific requirements, then they have customer specific requirements, these are added on top of ISO 9000.

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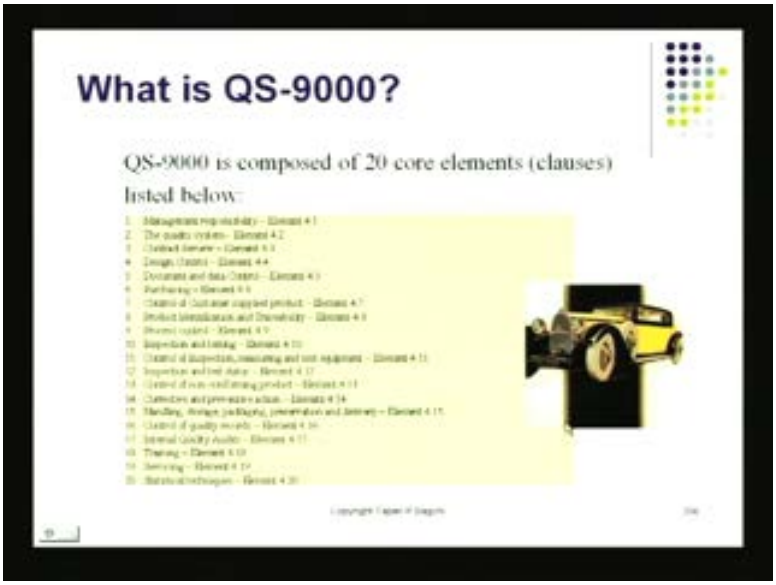

So, if the ISO 9000 basic requirements there then you got certain other requirements that have been added to it. And there are lot of elements in it and these assure the making of a fine car.

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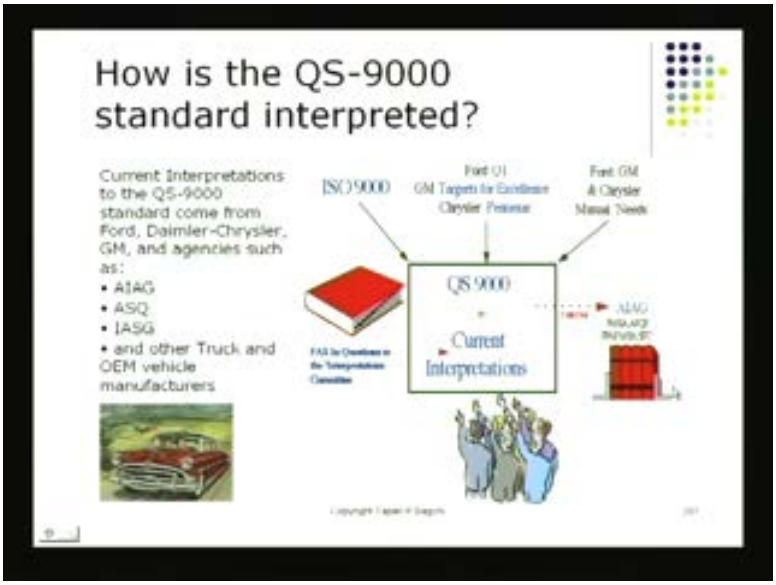

And of course, again this one really tells you that they foundation is the ISO 9000. But, on top of that many other requirements have been added on and certain procedures have been added.

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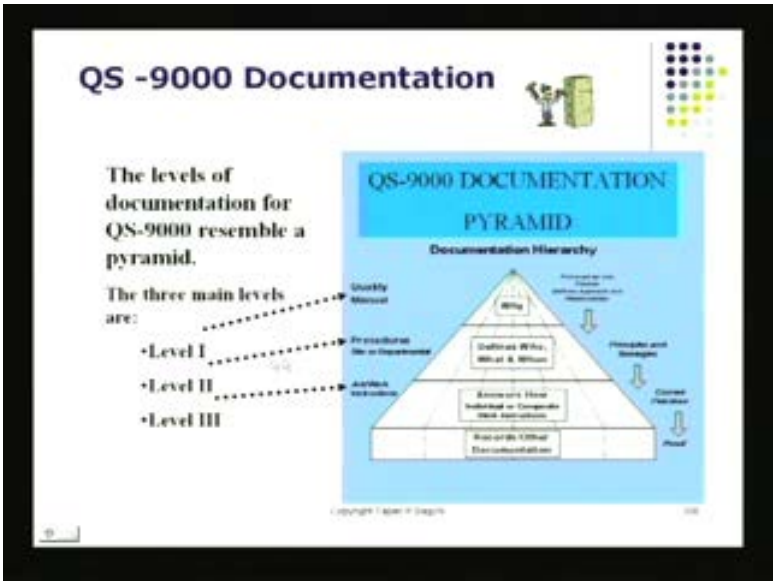

For example, new product introduction or new part approval those are specially done this way, if you do a comparison of QS 9000 with ISO 9000. ISO 9000 is nonspecific by design it does not really worry about a particular finish product. whereas, QS 9000 is focused on automotive works automotive manufacturers.

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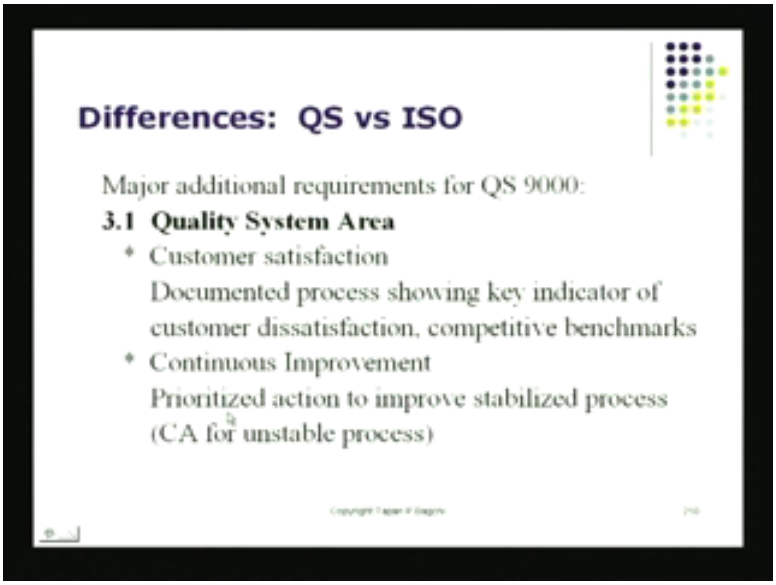

ISO 9000 is a tool geared toward all types of industries whereas, the tool for QS 9000 is really automotive parts manufacturers and the automotive industry. And there are certain differences there that again should be clarified. Once you go in to the clauses quality systems area there is a there are additional requirements with QS 9000, which I show you are on this slide there.

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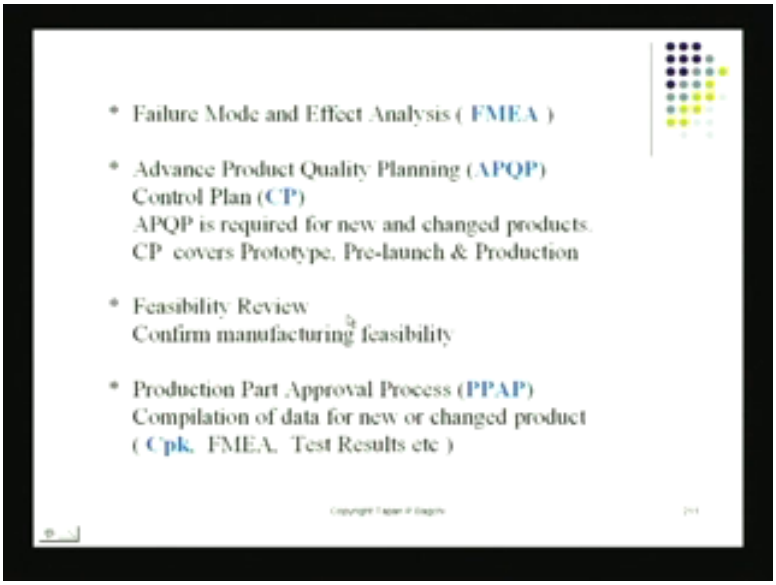

I show it in a next slide, when we got additional requirements advance product quality planning this also has to be done if you are going to be registered under QS 9000. You

also should be doing something called production part approval process. Before you go into production if you changed a part of your design a new product, new part you have to go through this P A P P procedure. And you also supposed measure your CPK, this is like something that all together not a requirement in ISO 9000, but, in QS 9000 CPK is a requirement.

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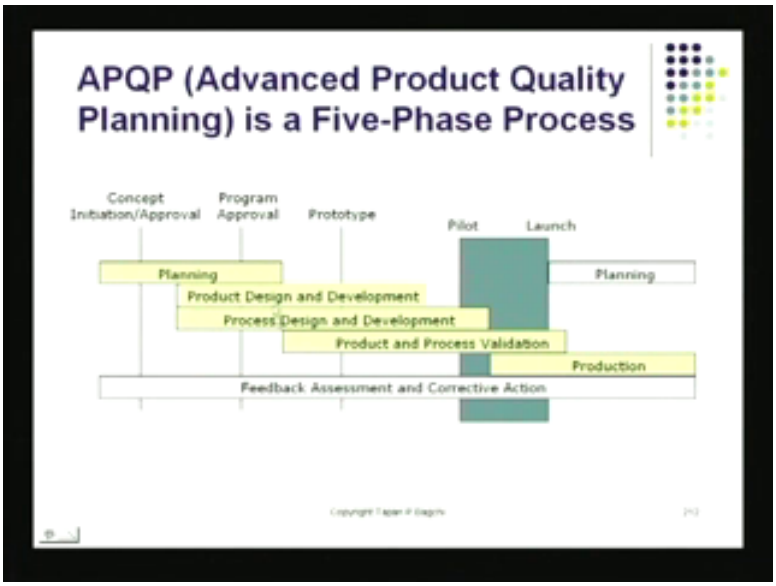

And there are 5 this a Five-phase process, A P Q P advanced product quality planning this is like before you go into commercial production, you are supposed do a product planning, product quality planning for this. And for doing this you are really supposed to be doing this.

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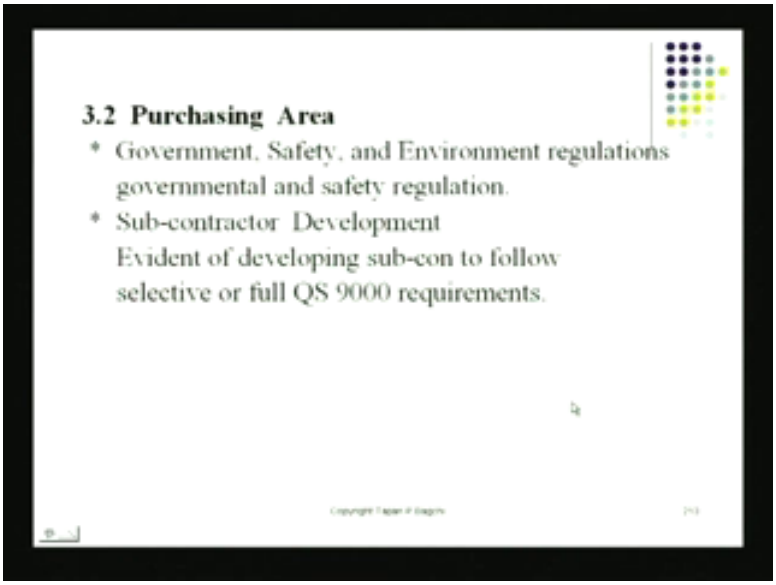

Then of course, I have got the purchase area, where I have got some controls that have to be there and those are required. They are pulled out here and I display them here for you.

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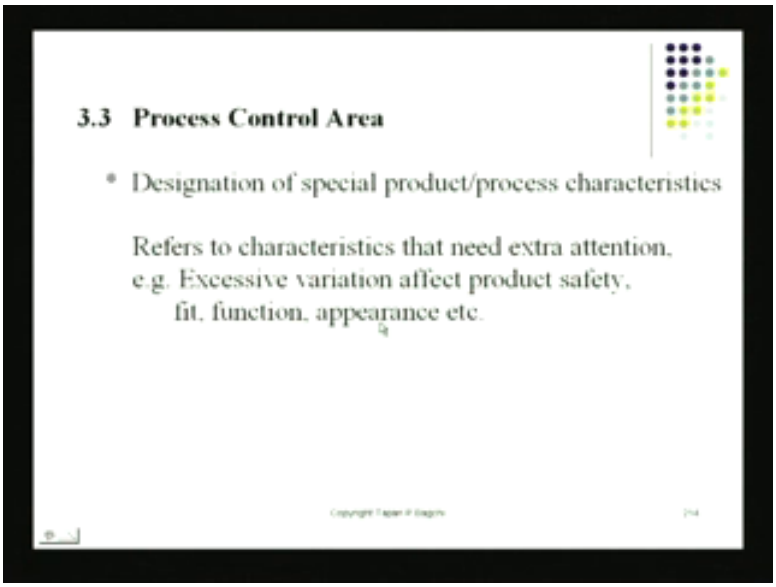

Process control area again here I have got extra attention paid to variations. Control of variation is a big thing and safety of course, is another big thing these are all required as a part of QS 9000.

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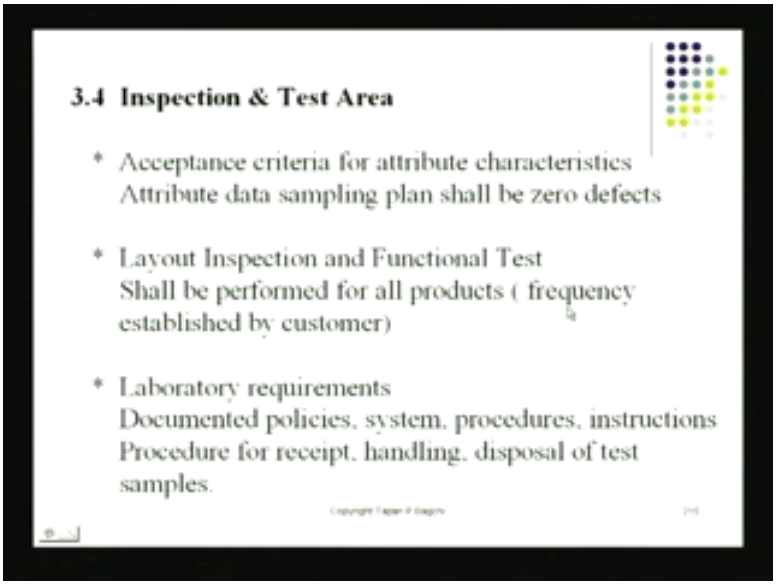

Inspection test area there again there are certain specifics, which are there. Acceptance criteria for attributes these have to be, we go to make sure we really worry about zero defects. We really, we are happy only with zero defects, not some percent level, not the AQL or QL type of situation. Then of course, we have got layout for inspection functional test area that also is spelled out in QS 9000. Certain requirements are there in the lab. Besides, what we call calibration requirements and so on and so forth.

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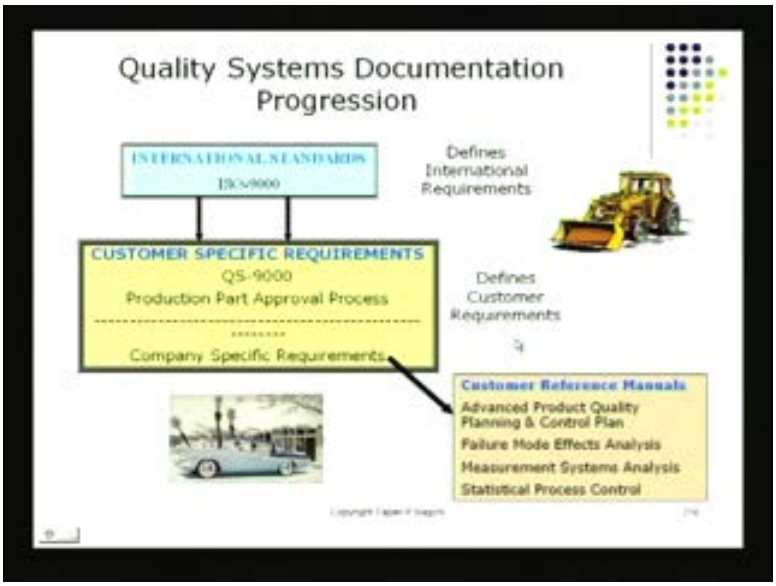

So, there are international standards requirement which is like ISO 9000 then I have got customer specific requirements. And then of course, customer reference requirements which are also there. And I produce manuals also, which are all part And partial of QS 9000.

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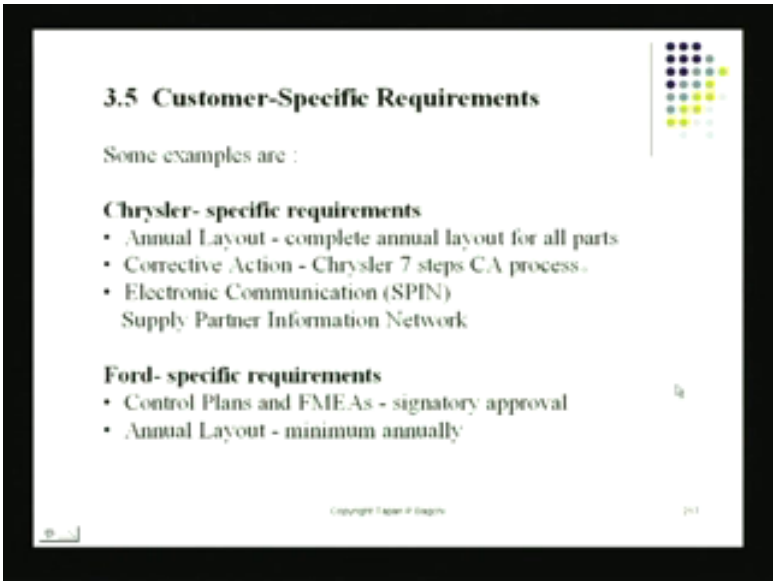

And those are spelled out again there are certain things required by the Chrysler required by Ford and certain things required by general motor. These are specific and they differ from industry to industry, business to business and those are all acknowledge by QS 9000.

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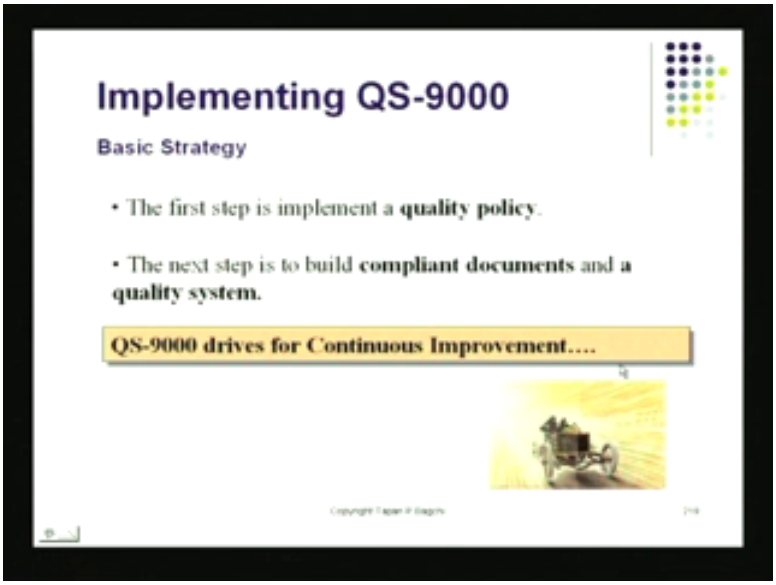

Implementing itself is a continuous drive and the implementation takes you through a whole bunch of steps. That you have to go through implementation is one of the key things that is required here is proper documentation.

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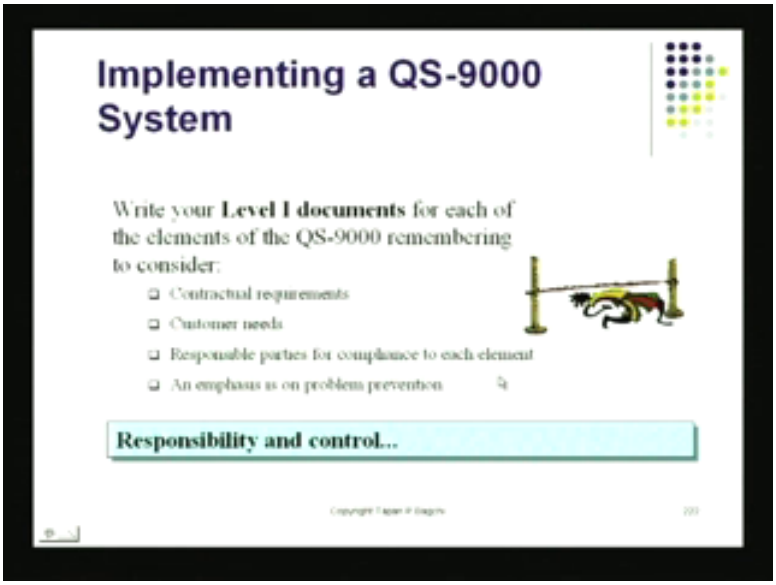

You got to spell out responsibility and control you got to make sure the all the controls are there all the requirements are there.

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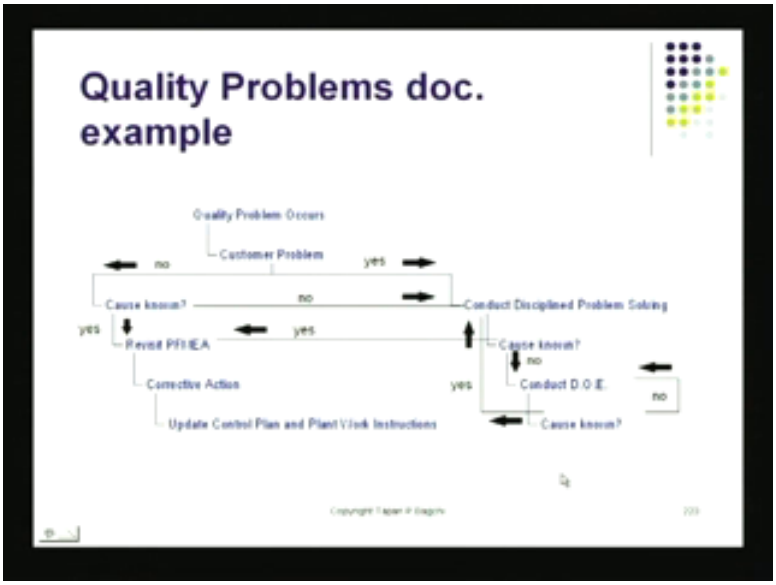

This is part and partial, if there is a problem with quality how I going to be investigating that if a customer has complained about the problem. Is it a problem with the customer if it is yes then you follow a particular route this is spelled out in QS 9000. This is not something that is arbitrary for a company to do or not to do. If I going to be certified, under QS 9000, you are supposed to, follow this process. And they spell it out very very clearly in their manual in their standards.

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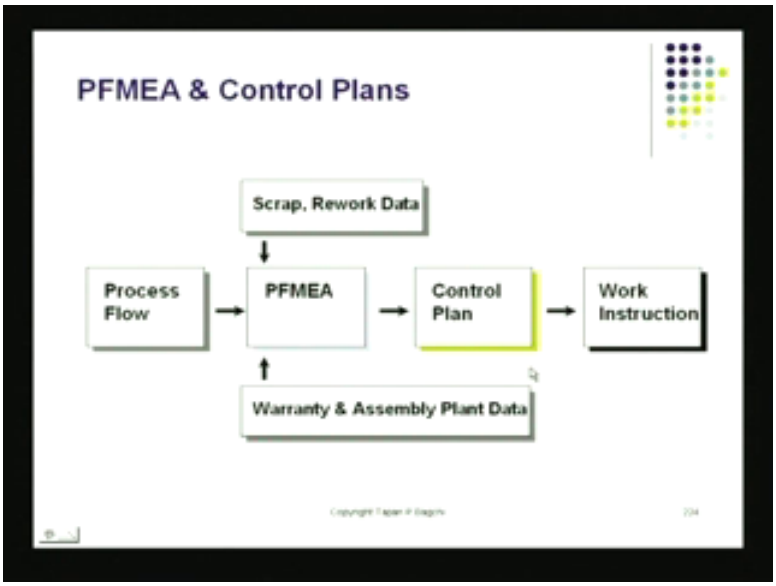

PFMEA again certain things are required and they are spelled out here. Implementing QS 9000 and conformance to specific customer requirements these are there.

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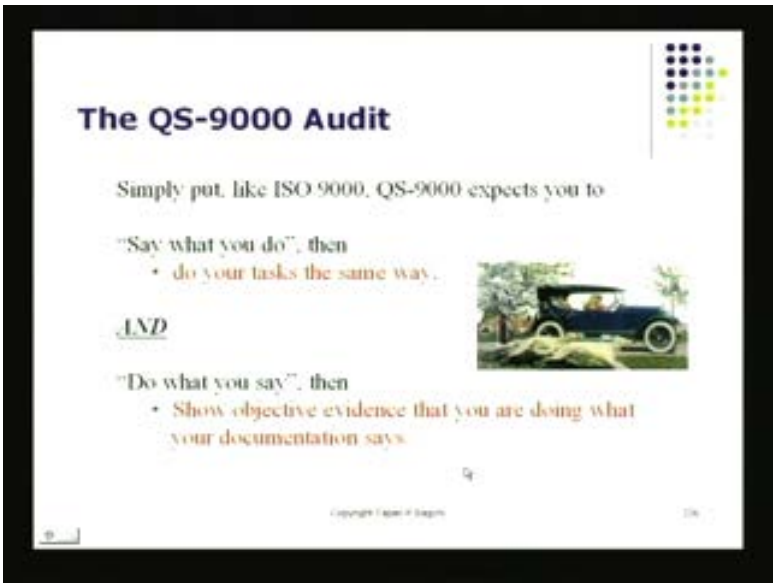

What is the advantage for doing this? One big advantage is when QS 9000 audit is done customers need not really go out to the parts supply and does their own inspection. They need not really do this.

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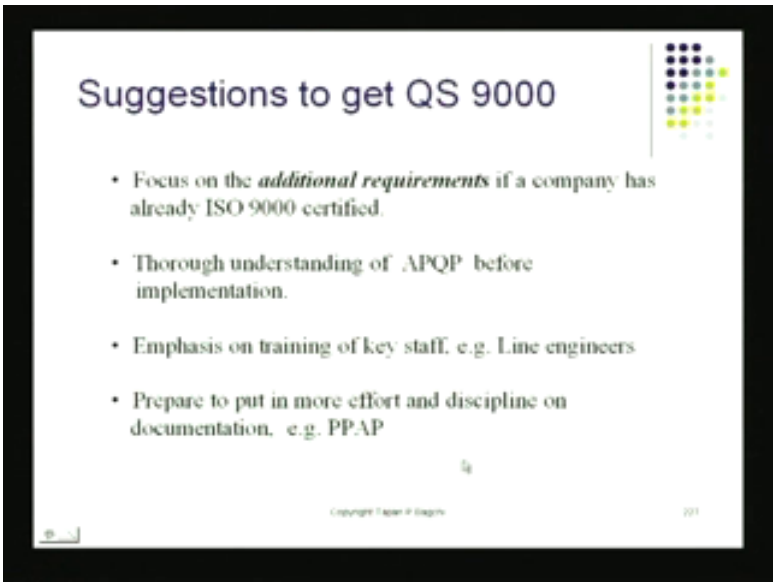

Certain improvements have been also suggested and these are done to try to make sure it is easy for you as apart supplier as a automotive part supplier to do this. This is rather

important for people to recognize once they are aspiring to become part suppliers to this thing. Now, you might say what are the Japanese doing in many cases their quality standard exceed or excel in many of these things. So, therefore, if they wanted to just tomorrow many of their parts suppliers could really get QS 9000.

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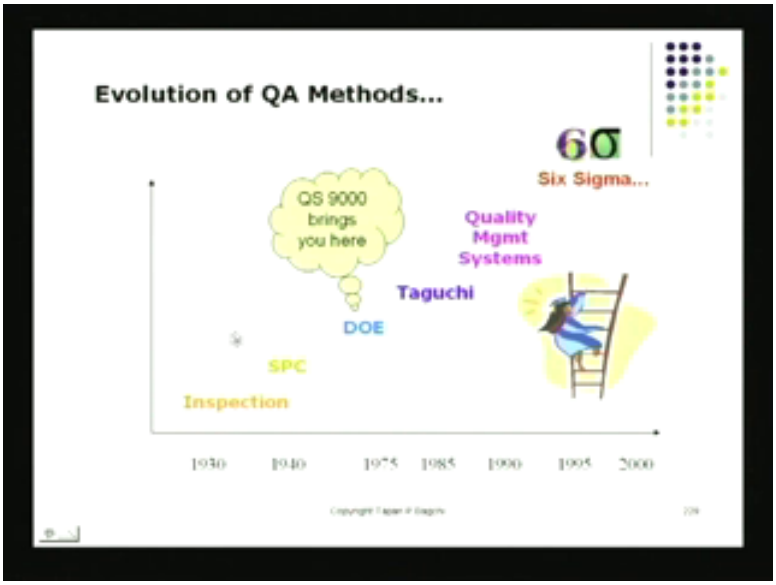

So, where am I today on this march of quality, we have reached up to this point when I am doing some DOE. DOE I am doing for doing design development. So, I have got everything in control as far the inspection is concerned. As far as statistical process control is concerned I have got my CPK in place and I am doing certain things in DOE. When I am designing parts and products, I am doing some designing to try to make sure. I produce a good product that is where QS 9000 registration will bring you.

This is a long way from where you started. I will tell you this that perhaps if you look at the industry spectrum not more than may be 2 or 3 or 4 percent people qualify to get QS 9000 this is something you got to keep in mind. This is not something that is so easy to get. And therefore, there are very few people that reach up to this level of quality assurance. Once you have that you can be assured about the parts that you get for your finished products. If you are getting parts from various people and they are all QS 9000 certified. You worry only about your assembly, you do not really have to worry about the quality of the parts coming in. Thank you very much we will continue, thank you.