Functional and Conceptual Design
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Indian Institute of Technology, Madras
Lecture No. 14
HoQ

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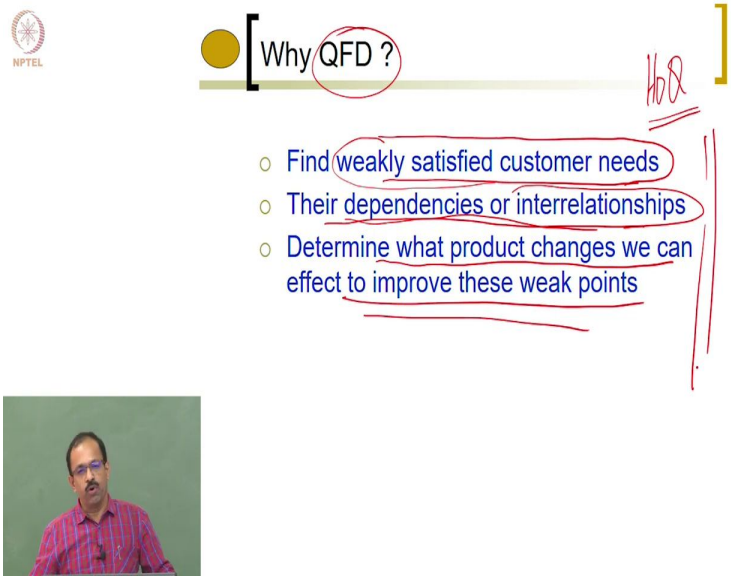

So, in the last class we discussed House of Quality and then we mentioned that House of quality is a tool which normally used in QFD, Quality Function Deployments. The quality function deployment has multiple applications, so we will be using the house of quality to do few things in the product development. So, first of all, we need to find out what are the weakly satisfied customer needs in the product design process.

So, we identified a lot of customer needs and then we tried to find out the metrics corresponding to this need. But finally, we want to know whether all the metrics are properly identified or all of them have the same kind of influence. So, is there any weakly satisfied customer needs that we are trying to address. Now some of the customer needs may be very easy to address, some of them may be difficult to address.

So, what are those weakly satisfied customer needs that we need to look at based on the metrics that we identify and then we need to look at what are the dependencies or

interrelationship between the metrics, there are some metrics when you try to change, it may get affected, last entry, no more entries.

So, we need to find out what are the dependencies of the metrics, how each metric is related to other metrics and what are the interrelationship between the metrics that need to be identified and determine what product changes we can affect to improve these weak points.

So, the whole idea is to check what are the weak points and how do we improve the weak points. So, that is why we are using the House of Quality and then we saw how to develop the House of Quality. In the last class we mentioned how to do this.

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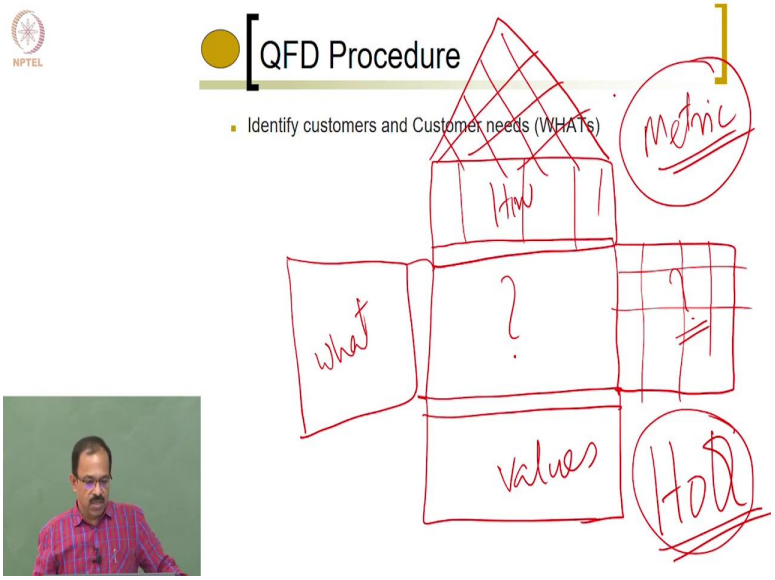

So, the procedure was mentioned as you identify the customer needs its importance then the metrics. So, what do you want to change how you will change and their relationship between this metric and needs, how they are related? So, here we will be able to identify how strongly they are related or how weakly they are related and then we look at the direction which each metric needs to be improved and then we look at the benchmarking. What is the current level of satisfaction by different products?

So, this is the benchmarking, so you will get that benchmarking of customer satisfaction how good they are satisfied or not and then we look at the values used by the competitor for each metric and use this one for and finally, you have a correlation matrix, which relates the metrics and each metric how they are actually related.

This is known as the house of quality, where we try to put in all the needs metrics, benchmarking values, and relationships. So, all that information everything is put into a single page and that is known as the house of quality.

So, the whole purpose of adding doing this is to find out the weak needs or the needs which are weakly satisfied, how the metrics are interrelated and finally, to decide which metric can be changed to get the decided performance of the products. So, that is the idea of doing the house of quality. So, this is what I discussed, I mentioned in the last class.

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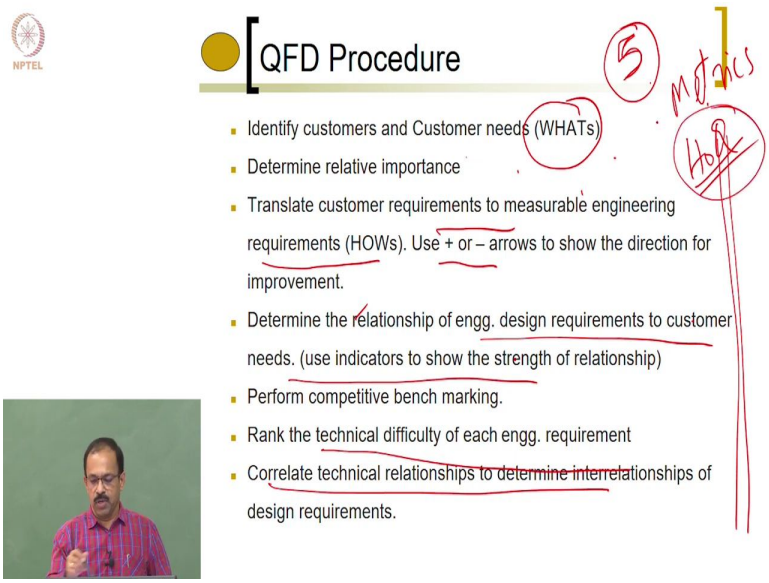

So, what we do is identify the customer needs. So, that is the ‘Whats’ and then determine the relative importance, translate requirements to ‘How's’ or the metrics and use plus or minus arrows to show the direction of improvement and then determine the relationship of engineering design requirements to customer needs, the strength of relationship,

perform benchmarking rank them technical, rank the technical difficulty of each requirements and finally, create the correlate the technical relationship determine the interrelationship of the design requirements, these are the steps involved in developing the house of quality.

So, in the lab today, you will be doing this exercise for the product that is given to you. So, in this case, you do not that exercise of identifying the requirements or the customer needs, you start with the customer need you assume that there are some five customer needs you can identify directly without going through the process, can identify five customer needs and then you need to identify all the metrics corresponding to this and then prepare the need metric chart and finally, the House of Quality.

So, that is going to be the exercise for today and the report should be submitted individually. So, the last two reports were group projects, group reports, but this house of quality I want you to give an individual report in the next class.

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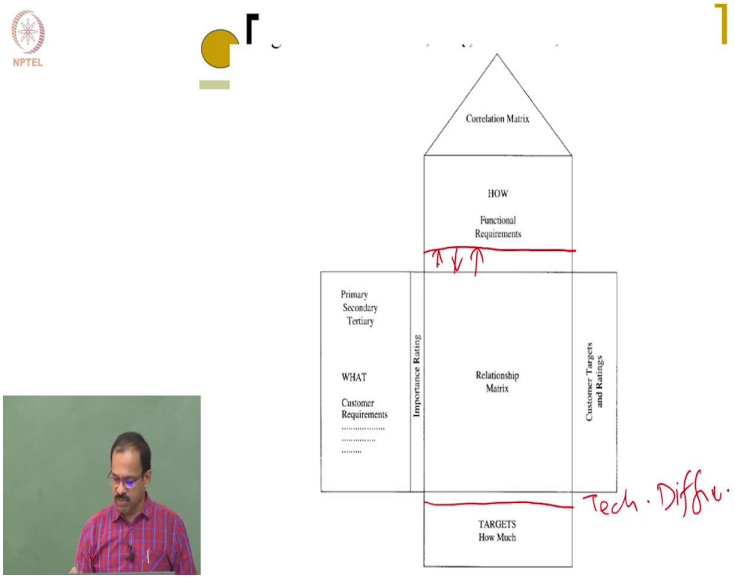

Though this one I already explained how to get it. So, the difference is that you will be having an arrow here, the direction of improvement, which direction you want to change, and then you will be adding something called technical difficulty. How difficult it is to

change the metrics some metrics may be easy to change, some may be difficult to change, so how easy to see change that will be done.

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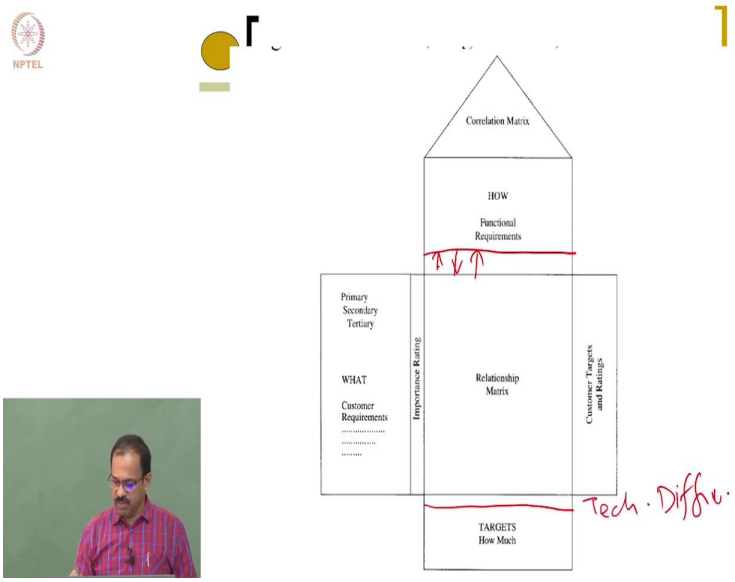

So, this is an example for the cycle fork design. So you have the needs here, you have the metrics here and they are the relationships strongly related or weakly related you can give. So what we will do, we will take an example and then see how to develop the House of quality.

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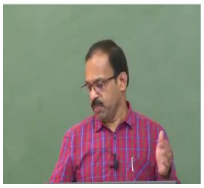
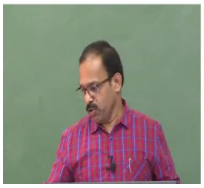
Example: Iced Tea Brewer

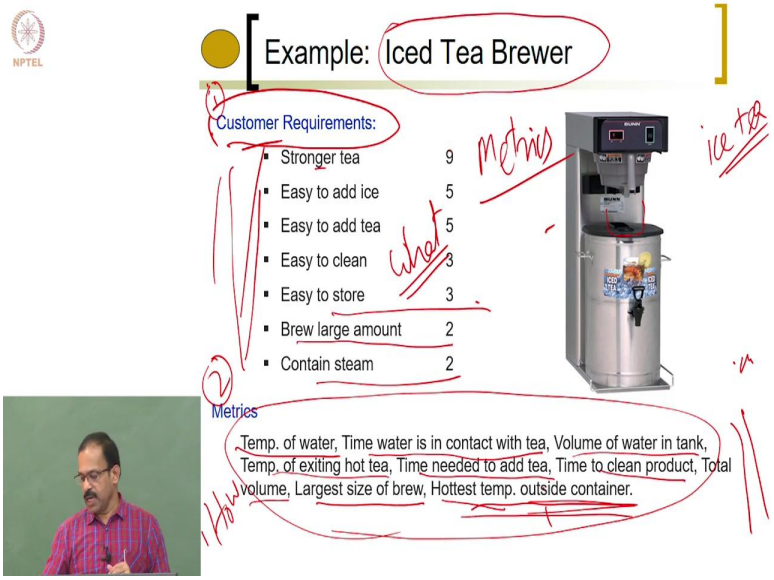


Example: Iced Tea Brewer

Customer Requirements:

Stronger tea	9
Easy to add ice	5
Easy to add tea	5
Easy to clean	3
Easy to store	3
Brew large amount	2
Contain steam	2





So, you may have first time when you do you may find some difficulty, so we will do an exercise. I want all of you to do it in your notebook. So, the product is an iced tea Brewer. So, might not be very familiar to you. But something called ice tea is very common, where you put an ice cube in the hot tea and then drink that is known as iced tea. So, this is a machine which actually delivers Iced tea when you press a button, that is all what you have to do, you have to pay money and then press a button. You will be getting the tea here that will be dispersed at these points.

So, now, suppose you are trying to redesign this product or are trying to design a product better than the existing products, you need to develop a House of Quality to understand the complete requirements and the challenges in developing these products. So, we have to see how to develop this House of Quality. So, what is the first thing you need to know? What is the first thing you need?

Student: Needs.

Professor: needs. So, we need to find out what are the needs of these products. Of course, you need to go through an exercise to do this. But for the time being we assume that we are done with that exercise and identified some of the most important needs of the tea

brewer. What are the needs you can directly tell now, as a direct need, what are the needs for a tea brewer or a tea dispenser?

Professor: So, what are the needs you can identify?

Professor: Pardon.

Professor: So, we are talking about the customer's needs. So, what are the customer's needs?

Student: Edible.

Professor: Edible. Yeah, coffee should be edible, an obvious need. Then?

Student: Various flavors.

Professor: Various flavors, then?

Professor: pardon

Student: Temperature.

Professor: Temperature of tea. So the temperature. Then?

Student: sensor

Professor: Sensor? Sensor is not a customer requirement, I mean sensor is for something else, what for a customer asked for a sensor, it should be easy to use what you want to say or what else?

Student: Ease to clean, easy to clean.

Professor: Easy to clean, yeah maybe easy to clean.

Student: large capacity

Professor: Large capacity, then?

Professor: So probably you can say good quality tea, roughly you can say quality of tea or I mean if you want to make it very specific you can say so quality of tea, then?

Student: Compact.

Professor: Compact.

Student: Easy to assemble.

Professor: Easy to?

Professor: Easy to assemble. So, we can actually identify many, some of them will be very common to any product, some of them will be very specific to this product. So, like this you can identify multiple needs from the customers and from the users. So, I will just write down here.

So, assume that these are the customer needs we identified. Strong tea, easy to add ice, easy to add tea, easy to clean, easy to store, brew large amounts of, contains steam these are the, not complete you can have much more needs from here. But for the example case, I am just assuming that these are the customer needs that you have identified and the importance also given. So, in terms of 9 is the most important like that it comes. So, the most important one is 9, then 5 and 3, 2 like this. Some of them are equally important. So given the same numbers also. So, what next, we have to do?

Professor: Pardon.

Student: So, what you need to do is to see what are the metrics that can be used in order to achieve this customer requirement, to satisfy this customer requirements. What are the things that you can identify? For example, strong tea.

Student: Amount of tea powder.

Professor: Amount of?

Student: Tea powder.

Professor: So, maybe the tea powder.

Student Time

Professor: Time of?

Student: Time, then?

Student: Temperature.

Professor: Temperature also matters.

Professor: Pardon.

Student: volume of the container.

Professor: Volume of container. Let us put it,

Students: Type of tea.

Professor: Type of tea. So, I do not know how you put this type of tea, tea powder you use, tea brand maybe. So, tea brand is an independent or dependent variable you need to think about, when?

Student: Dependent.

Professor: Dependent.

Professor: Because you can have a X brand or Y brand, you cannot have such X and Y mix rights. I mean X brand depends, does not depend on anything else. X is X only. Anyway, will we see any other brand or any other metrics you can identify?

Student: Thermal insulation.

Professor: Thermal insulation, because so probably you had to do each one, so contain steam, brew large amounts, what is the metric?

Student: size

Professor: Yeah size yeah, size of the okay it is a given volume of this, but volume with the product does not really ensure that it is a large amount of brew. So, the volume of water it can contain, maybe one or you can see the volumetric efficiency. Also you can say roughly, total volume to the volume that it can, water volume it can contain. So that way we can actually represent that metric? So, you can identify metrics like this. So, let me see those metrics here. So, these are the metrics that you can think of.

The temperature of water depends, I mean that actually affects the tea quality. The time water is in contact with the tea also affects the tea quality. Volume of water in the tank affects the large amount brew can be done or not. Temperature of exiting hot tea, that actually affects the steam, contains steam as well as the adding ice also, the temperature of exiting tea affects these two needs. Time needed to add tea that actually again affects the quality of the tea.

Time to clean the products, easy to clean total volume that again affects the brew large amounts, as well as easy to clean also, if the volume is very big or difficult to clean. Largest size of brew, again brew large amounts. Hottest temperature again affects the quality. Outside container I mean, hottest temperature outside the container. So, that is the, so these are some of the metrics. I am not saying these are the only metrics that you can use, but for this we can identify, these are the metrics that can be used.

What is the next step? So, the first step is to identify the customer requirements. That is the first one, this is the first one and then the second one is to get the metrics. What we will do next, we will try to prepare the chart. So, we know this is what we want to achieve. So what we want to achieve is this one, how do we achieve it by, how do we

achieve it by playing around with these metrics. So, by changing these metrics you will be able to meet the customer needs.

So, by changing the temperature of water or time of water in contact, you will be able to get a strong tea. So that is the understanding, but which one to change, we do not know, we still do not know whether all the needs are properly addressed or although all of them are strongly related, we do not know. So, what we will do is start preparing the House of Quality.

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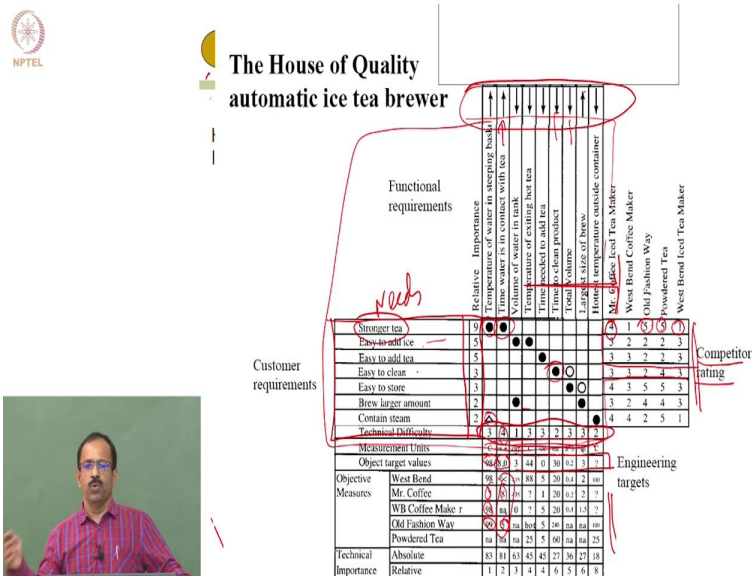

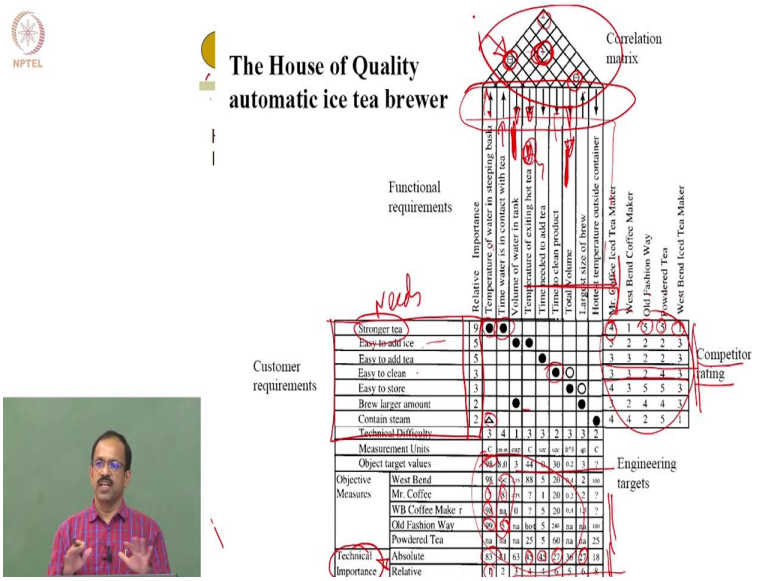

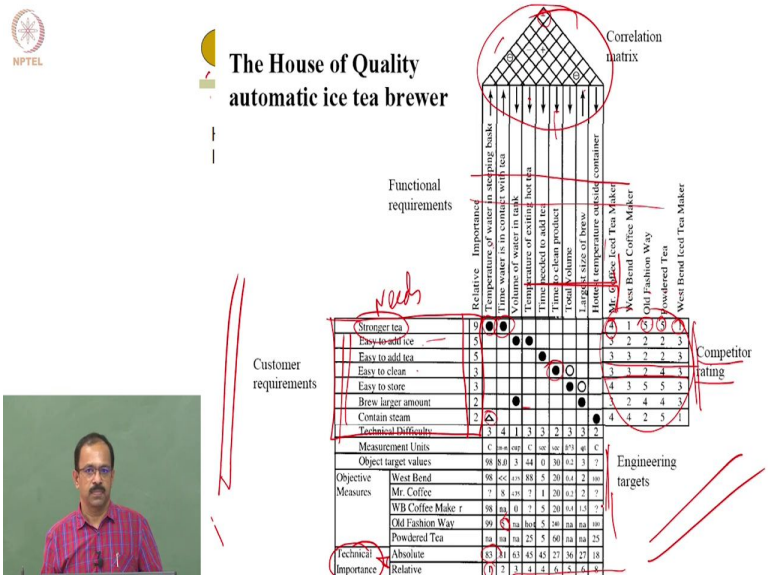

So, we will have this strong tea, this one as the customer needs and the importance here. So, we have needs.

Professor: Yeah.

Professor: So, what we are trying to do is we are actually trying to do everything together. So, the why values actually come from benchmarking. So, we are doing

benchmarking also in this house of quality. So, what we are doing first, we will actually prepare this part.

So, this is basically a needed metric matrix. So, we are preparing the first element that can be considered as the needed metrics matrix that we saw. The need and metric are shown here and their relative strength also shown. So, the dark one shows very strongly related and the white one shows, the white circle shows that they are not strongly related but there is a weak relationship between this metric and the corresponding needs. So, that is the thing here.

So, what we are doing is a need and metric relationship first we identify. Of course, then you do this, you can do it separately also and then try to bring them together. So, needs and metrics. So, you can see now the temperature of water in the basket is directly related to the strong tea as well as time of water is in contact is directly related, strongly related by changing any one of this you can increase the, improve the quality of the tea.

The strong tea can be made either by increasing the temperature or by increasing the time contact the water is in with the tea powder. So, any one of these can be used to improve the tea quality. Similarly, easy to add ice, volume of water and the temperature of exiting hot tea, here you can see easy to clean time to clean the product is the direct metric.

If you can reduce the time directly you can reduce the, improve the quality. But another one is that if you increase the total volume or decrease the total volume that also may affect the easy to clean, there is a relationship but then you need not be as strong as the other metric time to clean is the strongest metric, the other one is the weakest, week metric like this you will be able to see.

Similarly, this also you can have a third category as, so contains steam. So, you can have the hottest temperature outside the container if one actually matters, this also has got a light relationship. So, we can have three categories strong, weak, and then for the weakest

also. So, can have three categories of relationship. So, this shows how the needs and metrics are related.

So, this each metric can be seen, we can see, each need can be connected to a corresponding metric and one important point to be noted is that every need should have at least one metric. So, you can see in this row, there should be at least one in each row. If there is a blank one, that means that it does not have a metric for that. So, now we know which are the ones strongly related which are the one weakly related.

So, all these have got only one metric, many of these have one metric. But this one has got two metrics; they are very strongly related to two metrics. There is the first part that we do the need and metric.

Professor: I mean there is an atmospheric temperature, when you take the tea the atmospheric temperature is very low or very high. So, you can say I did not get the capability to be different outside because the temperature is very high. So, cannot add, you have to add more eyes to get the same quality. That is the, that is what actually it says here. Yeah you are alright now.

So, that is the first step needed and metric. Now what we will do, so as he mentioned we need to get the values. So finally, we need to get the specification saying that this is the value I have to use for each metric. We want to know what should be the temperature of the water in the basket, you know to get a strong tea, is it 100 degree or 99 degree or 98 degree. We don't know.

So, we need to get this value. Similarly, how long we do keep this in the, how long it should be in contact with the tea powder we do not know. So, we need to get that value, so at present we do not have any value. So, what we do, we will try to find out who are the people who actually manufacture these kinds of products and what are their customer satisfaction ratings and what are the values they use. So, we do benchmarking and we will try to find out.

Before that, there is this direction of change also. So, we know that the temperature increases, the tea quality increases, time increases, tea quality increases, the volume in the water in the tank decreases, then it is easy to add ice. But the temperature of an exceeding hot tea decreases again, making it easy to add ice. Time needed to add tea you want to decrease, because that will actually be easy to add tea also, the time needed.

Similarly, time to clean the product you want to decrease. So, this one you want to decrease, this one wants to increase this. So, you can actually get what is the direction which each metric needs to be moved in order to improve the quality. So, the customer will be more and more happy. So, by increasing the temperature you can get a much stronger tea. Similarly, increasing the time also you will get more tea by decreasing the time you will get more satisfaction that the time to clean will decrease.

So, this way we know what is the direction in which you want to move each metric. Now, we will go for the benchmarking. So, the first benchmarking is the competitor benchmarking based on the customer satisfaction. So, we assume that there are one, two, three, four, five companies already making these products.

We will look at how these companies are performing in terms of the needs, which companies satisfying the customer very well and for which company customers are not at all happy. That is what we do in the competitor rating. We will see that for strong tea, so this is the best, these two are doing very well, old fashioned way and the powdered tea they are the best thing and the next one is the these two are not companies, but this the Mr. Coffee iced tea maker that is the best one and this company has the lowest.

I do not remember which are the 1-2-4-5. So, this is the way we can give the rating. So now we know who is actually best in this category. Similarly, easy to add ice, easy to store, easy to clean everything we can actually identify the customer satisfaction. Now what we do is, we look at the best company for this particular thing, stronger tea and then look at what is the value they are using for these two metrics.

Because these are the two metrics affects the quality of tea and these are the two companies which actually do, I mean this is the company which actually do the best way to do it, we will find out what is the value he is using and we tried to find whether that, that value we can use, that is the way how we do this.

I forgot to mention the technical difficulty also. So, technical difficulty tells how easy or difficult it is to change the metric. Some of the metrics are very easy to change, some of them are very difficult to change. So, this is very easy to change the volume of water in the tank and can be easily changed by increasing the size. So, difficulty is very low. But when the water is in contact with the tea and wants to have more time as it passes through, then it may be a bit difficult to plan and execute. So that will be more difficult.

So, we will give you a difficult and easy also. So, one advantage is that you can decide which one to change, the easy things can be changed or the difficult can be kept without change also, depending on the situation. So, we have this benchmarking Competitor benchmarking which actually gives the customer satisfaction with respect to the customer, the products. Now we try to see what is the value they are using. So, here you can see the value, each one what is the value they are using for each of these metrics.

For example, Mr. Coffee, what is that temperature of water in steeping baskets, we do not know, because they consider it as a secret or they do not inform. So, question mark, we do not know about this and this Mr. WB Coffeemaker is 98, Old Fashion is 99 powder not available.

So, these are the temperatures that are currently known 98, 99. Similarly, each one temporary time of water is in contact for eight seconds, not available for five seconds. So this way, gives you an idea what is the value these companies are using and how they are actually satisfying the customer needs.

We get all these values. Now, based on this and this information we can use and based on what we can say, tell or what would be our target value for this or ideal value or the target value, we can see that okay this company, Mr. Coffee Maker uses 98. So, they have a

reasonably good rating. So, either you can use the 98 itself or you can make it 99 or 98.5 to better than the, to improve the tea quality.

So, if you want to get better than this company, you can decide to have a different temperature. Similarly, you can have a different time to improve the tea quality. So, this way, these two by looking at the customer satisfaction of these two products and the metrics they are using, you will be able to get a value or for your metric or for your design, you can decide what should be the temperature of water in the tank. That is the way how you get the target value.

So, now we write the target value here, the object target value. So, you can see it is 98 8. So, we are assuming that okay we can maintain the same kind of quality compared to this one, because they are well satisfied people are satisfied. So, we can actually go for 98 and 8 itself. Similarly, if the parameters can be obtained, the target values can be obtained, something is not available, we will put it as a question one because we can do more research and then try to find out.

So, that is the way how we actually get the target values for each and every metric. So, we use this information and this information and depending on what the team is trying to achieve, you will be able to get the values that are the target values for the design.

Professor: So, this one see, this technical important says that out of these metrics which one you do more importance in the development. So, this is you are saying that okay this is absolute values 83 percent of this change will actually affect the tea quality. So, or you can say this is the most important one and these are the relative importance of these metrics we say, based on these values that you can get, this again is given by the designer.

Professor: Yeah, this is the rating and this is absolute value and based on the absolute value given the ranking. So, 83 percent of 83 is the absolute importance of this particular metric that is used first as an important. That is what actually and this is decided by the

designer it would not come from the, this chart. So, you need to decide which one is the most important one and then accordingly do it. Yes.

Professor: Which one?

Professor: So, some of them are equally important. So, you had the value 45 and 45. So, we give equal importance to that. So, we give the same ranking for that too and then we remove one of these in between. So, 4-5-6-7 is not there. So, 7 is not given I think yeah. So, some of them are equal. So, these two are equal, so you both have the same ranking.

It is only for the designers to know which one is, which is the one which relates to each other metric, which metric is more important in this particular case, which metric is the least important. So, that is what actually gives here. So, this is the most important one, the second third and these two are equally important. The temperature of both are equally important. That is how it is mentioned here.

Finding it difficult? Yes or no.

Professor: What is the temperature outside a container? Not true. Because if you are an air-conditioned hall, this coffeemaker is an air conditioner hall and it doesn't really matter. It is not that difficult to do it only outside the outdoor environment you have difficulty in controlling, but.

Professor: No, no see suppose you are having a restaurant which is air conditioned and you are keeping this as a machine, therefore spacing then it is very easy to control the temperature that is what actually means. So, the last part is basically to know how these are related to each other. Suppose I change something and the other one is going to get affected. That is basically the interrelationship between the metrics. So, we get the top part of the House of Quality by this.

So, what we look at here is, suppose I change the temperature of water in the basket, are there any other metrics getting affected because of that? So, I want to increase the

temperature. Now, when I increase the temperature, is there any effect on any other metrics.

So, I look at this particular metric, the temperature of exiting hot tea. So, when it increases the temperature of water in the basket what will happen to the tea, coming out tea. The water, the tea coming out, it's temperature will go up, because and you increase the temperature within the basket, of course, the tea coming out also will be having high temperature, but what we need is basically to reduce the temperature of exiting hot tea. So, the requirement here is to reduce, but when I increase this, this also will increase.

So, I will say there is a negative correlation between these two metrics. So, I should be careful, if I am trying to increase this, there is something which actually gets negatively affected. So, I should not arbitrarily change that because that may affect the other metric, which will go against the direction of movement. That is why I will give a negative correlation here.

So, you have a negative correlation here between these two metrics, this metric and this metric has a negative correlation because, when I increase the temperature of water in the basket the temperature of tea also goes up, which I do not want, I want to reduce the temperature for some other reason.

So, there is a negative correlation between these two metrics. Now, look at this one volume of water in the tank and total volume. So, this is the volume of water in the tank, which I want to decrease. So, when I decrease the volume of water in the tank, what will happen? The total volume also will decrease, I mean I can decrease the total volume by reducing the volume of water in the tank, by reducing the water tank volume I can reduce the overall volume.

So, my requirement is to reduce the overall volume and reduce the volume of water in the tank. So, if I do one of these, this also gets affected in a positive way. So, I have a positive co-relationship. So, now I know by changing one of these, I can actually achieve

the other also, I do not need to change both the metrics, anyone metric will actually do this job for me. So, that is basically the positive correlation.

So, like this you can identify the relationship here negatively and that strong, very strong and strong can be given either by a simple negative and then negative and the circle will give how strongly they are related. Some of them will have weak relationships, some of them will have very strong relationships. So, the weak and strong can be represented using a circle and additional circles.

So, that is the way how you get the correlation matrix in the House of Quality. So now, we have all this information, whatever we have discussed so far, everything is in a single page, by just by looking at this diagram, the designer will be able to tell, which one is easy to change which one is difficult to change and when I change something, what will happen to the other one. So, based on this, the designer will be able to decide which are the things he wants to change out of these metrics and then what should be the values here I want to use for that, this is clear, it is only a question of how do we actually design it.

So, that is the importance of House of Quality that you can get all this information in a single paper on a single sheet and the design decisions can be made using this and you also know, which are the weak relationship and how the interrelationship is there, all those things can be identified and then you can take a decision on how to go about the design process, which one you want to change, which one you want to keep the same and what parameters you want to use and if you use those parameters, how much satisfaction can be obtained, all those thing can be received or understood in this diagram.

So that is the House of Quality for the products. You know why you want to make the same, I mean so effectively what we are saying is, if you make the container big, you have an option to increase the volume also, the volume of the water tank also can be increased by increasing the overall volume. So, if you reduce the overall size, then there is a possibility that overall, the water tank size also needs to be brought down.

Professor: There is no I mean, that is intentionally you do not change it, then it's but functionally they are related. So, by changing one you can actually get the other and also get changed. So, you want to change the size of the water tank and then what do you do? You want to change the, one is very clear, we change the water tanks the size also will go up, provided you have already made it as a compact one it will increase.

Now you want to increase the size of the product. Why do you want to increase the size of the product? For some reason, then there is a possibility that you can actually increase the size of the water also, the water tank also can increase because overall size increases.

So, there is a possibility that you can actually increase the size of the water tank also. So, that is why they are related, whether you really do it or not is a different thing, the design process whether you do it or not is different, but they are related to each other because there is that possibility that you can change it, positive in the positive direction you can change it.

Professor: So, suppose there are no products at all, see there is no product at all and you want to design something suppose there is nobody making this tea. But it cannot be something which was not at all existing in the world. I mean, for example, you are making a tea brewer, there are people who make tea using conventional methods. So, you know what is a normal temperature they use, so we will try to use those values to make the product.

So, somewhere something will be available you will not be completely in the vacuum when you start a design. So, you need to or you need to go and find out, suppose you are designing a product, a new product which you want the people to carry. So, what do you look at, you look at what other people, what things normally people carry, what is the approximate weight of that product and what is the size of the product which someone can hold in your hand? So, you take those dimensions as your initial target values, then you may do a lot of iterations to find out the actual values.

Professor: This actually we need to do go through the competitors' products, their catalogues and the information what is available in the public domain. Nobody will give you directly. So, you can go through their catalogues and find out there are some research papers, whatever it is. So, you have to do some kind of market survey to get this information, this information would not be directly coming, the team has to do some homework to get it. Any other questions?

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So, this is another example, I will not go into the details. So, this is about the computer server. So, if you want to do the house of quality, it's quite a big one. So, I do not expect you to remember this house of quality like this. But when you get a product, you should know how to develop a quality house. So, each one you do not need to remember and the house of quality is not unique. So, I can make it in my own way. You may make it in a different way, you may use a different metric, you may use a different need. So, there are differences, but you can see.

So, this is what the customer needs. We can see based on different categories, the power requirements availability, operational requirements and environmental requirements, we have identified the customer needs and the priority or the importance also identified here and these are the metrics, maximum number of processors, controllers, clock rates, wire rate etc.

So, these are the customer needs and you can see the relationships given here 1-3-5. So, 5 is very strongly related, 3 is weakly related and 1 is a very weak relationship. So, that is 1-3-5 you can see, but you get the high performance, so many metrics are associated with

the high performance. You do not need to change every metric, some of the metrics you can change to improve the performance of the server.

But every need will be having at least one metric associated with this. That is most important. Average metrics should have, every need should have at least one one metric associate with it.

Then go or the correlation, this is the increase or decrease direction you want to maintain. You do not want to change it to 0, you want to increase or decrease arrows up or down arrows and these are the relationship positive. So, strong negative, strong positive, moderate negative, moderate negative, strong negative, moderate negative, strong positive, moderate, something wrong with this, moderate positive it think, strong positive moderate.

So here everything is there, so this basically shows the relationship, how the individually each one is related. Then we look at the competitor benchmarking. So, it is Sun server, IBM server or HP server. You can compare with these three companies. So, there are, how they are strongly related. So, 1 is low and 5 is high. So, this is 1-2-3-4-5 like this. So, you can see this, the Sun is highly satisfying this requirement of high availability.

Similarly, this one is, Sun again gets the high performance it is moderate gets a 4. So, like this you know, which one is actually satisfying the customer requirement and then now you look at the values. The values are not given. So, we can actually get the target values by looking at the values, what they actually use. So, in this particular graph it is not or it's at bottom I think, I am not able to show it to you.

But looking at this and then looking at the values they use, you will be able to get the values to be used. Target values to be used by the designer. So, the current design you know which one to be used, which value to be used as the target value. So, that is the House of Quality for the computer server. Got it. Any questions, so now you can do it yourself for a given product. For example, suppose I take a very common product.

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We will take the QFD for a refrigerator. So, we will do this in a class tomorrow, come prepared. So benchmarking values you can assume, you do not need to go and find out the details. Benchmarking values you can assume, for given, for any products. But you know the refrigerator, what are the different companies which manufacture refrigerators? So, you will be given like in the previous tutorial, you will be given a sheet. Will be asked to prepare the House of Quality and submit at the end of the class.

So, what you need to do is identify the customer needs, you do not need to do any exercise, some common needs you can identify. As a user of refrigerators, what will be your requirement? Small size large storage capacity good temperature maintenance things like that and then identify the metrics and prepare a need metric matrix, then find out the technical target values using benchmarking, identify the technical difficulty of each metric and then do the dependency or interrelationships and finally prepare the House of Quality and the this is the House of Quality.

So, this is what actually you need to finally have it and submit and this one you need to do for the product that you are doing today also. So, as an exercise today in the class you

discuss and prepare one as a class exercise, but then you go back and then do it yourself and submit as a separate report for the lab reports, thank you.