Functional and Conceptual Design
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Lecture No. 20
Portfolio Architecture Selection

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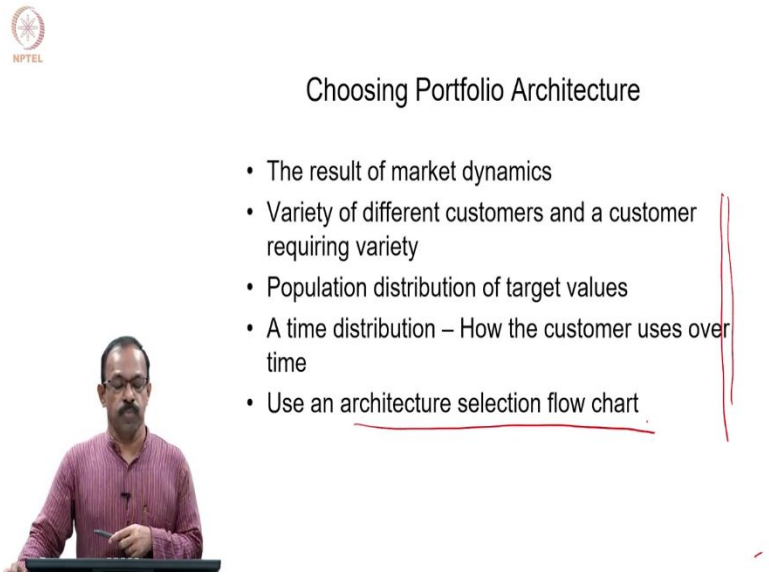

Good morning. Welcome back to the discussion on product architecture. So in the last class, we discussed various portfolio architecture. We found that there are different types of architectures. Basically, we have unshared platforms, modular platforms. In modular itself we have modular generation, modular family, etc. So, the question is how do we actually decide the portfolio for a particular product? And then in the last class we stopped here.

We mentioned that it basically depends on the market dynamics, what the customer population is looking for and how their preferences change and what are the variations of their preferences within the group itself. So, looking at all those aspects and of course, the cost and revenue, we need to decide the architecture. To do that, we use an architectural selection flowchart and looking at the flowchart and then deciding, what would be the best architecture for a particular

product can be decided. So, that is what we are going to discuss in this class. What are the ways in which we can decide the product portfolio architecture?

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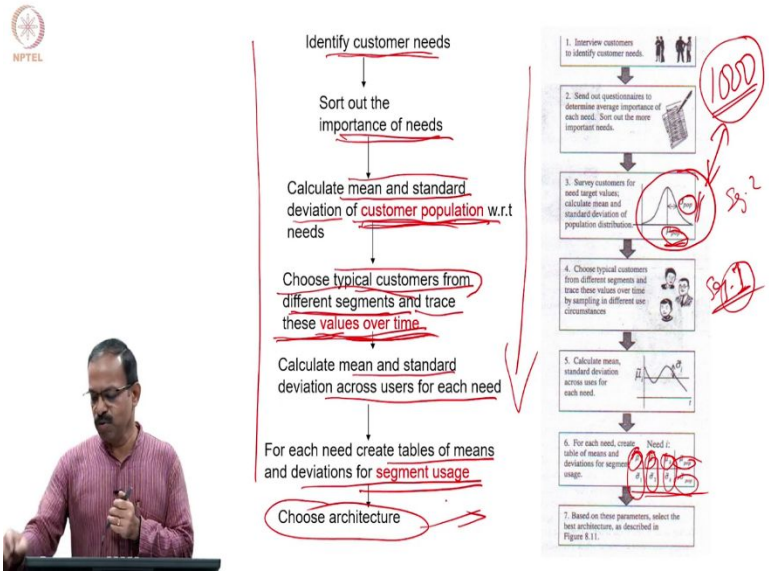

So, the flowchart is given here, we need to identify the customer needs. As we know, first we look at the customer needs and prepare a list of customer needs with their importance and then look at those important needs and then find out what is the mean and standard deviation of these customer needs in terms of their objective values within the customer population.

So, the total population we take, suppose there are the 1000 customers you identified, for this thousand customers, probably there may be three or four needs that you can take initially and then find out, for example, cost, the size and capabilities or processing capability like that you can identify those needs and then find out what is the mean and standard deviation of these values, these values of this customer needs, that is the first step, so get a customer population distribution.

Normally when you take a distribution you always will be following a normal distribution, so we will be getting something like this kind of a distribution. Here we will be having a mean value, the mean of the population. And then we can have a sigma that is the standard deviation of that

particular need. So, for every need you will be able to find out a mean value and a standard deviation that is for the old population.

Suppose there are 1000 customers, you want to survey for all the 1000 customers, you try to find out what is the mean and standard deviation for each need. And then choose typical customers from different segments. So, this is another important point, we need to identify segments within the population. If there are a 1000 people in that group, it will not belong to the same kind of segment. For any product you will be able to segment the group, segment the total population based on some characteristics.

So, the characteristic would be the age or the gender or their buying capacity or their occupation. There can be many ways you can actually segment the population. We will be able to identify the low income group and high income group or the student population and the employed population or male and female or all the elderly people and young people so this way you will be able to identify segments. You need to identify the segments based on how much affinity they have within that group and how much they differ from the other groups also.

If there is a lot of difference between these two groups, then that makes them 2 segments or 3 segments, depending on the number of segments that you can identify. Try to identify segments and then choose typical customers from these segments and trace these values over a period of time. This is a bit tricky because you want to know how these customers within the segment change their preferences over a period of time.

A young person who is looking for a phone today will not be having the same kind of preference after 1 year or 2 year, so we need to have some idea about his preferences and how his preferences are changing over a period of time. We will get this only through some kind of observation of the market or looking at the previous generation product in the current generation and how people change their preferences or asking some questions to the customers.

So, doing this kind of an analysis, you will be getting some information about how these values change over a period of time. If sigma and μ have a large variation, then you need to think of a

different architecture. If there is no variation over a period of time, then the architecture will be different. That is the next step to identify the values or a period of time.

And then calculate the mean and standard deviation across users for each need. So, for each need you need to identify the customers mean and standard deviation, and the last one is, so for each need, create tables of means and deviation for segment usage, so this one was the population usage. Now, within the population we identify 3 segments, segment 1 with maybe low income people, segment 2 can be medium income and segment 3 can be a high income group.

So, we can actually divide the whole population into 3 segments. And then within the segment, you try to find out what their mean and standard deviation are. So, a low income group will be having some values for the cost and the size, high income group will be having a different value for the cost. So, we need to find out what is the mean for each segment, $\mu 1$, μ 2, $\mu 3$ etc.

For each segment we try to find out the mean and standard deviation for each need. So, we will be getting a table like this. You will be having the population mean and population sigma and in addition to that, we will be getting the mean and standard deviation for different segments also. Now we have a lot of information collected through customer surveys. You have the population mean and a population standard deviation for all the needs.

Then we have the variation of these values of μ and Sigma over a period of time for each need and for segments also, we have this μ and sigma for each need. So, with all this information we can actually choose an architecture based on this information. We use an algorithm to do that. So, this is the flowchart of selection. Here we use a very simple algorithm to choose the architecture.

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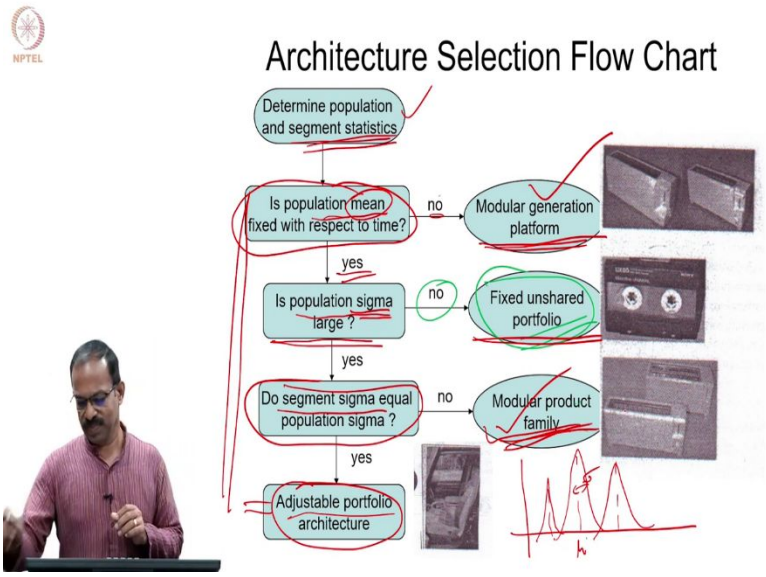

After once you have all this information, we go to this algorithm and then try to see how to select the portfolio architecture. The algorithm is like this, you determine the population and segment statistics, as we mentioned in the previous slide, the statistics, basically the μ and standard deviation, it is the mean and the standard deviation for all the needs for population, segments and the time variations, or the variation over a period of time.

Now you will ask the question, is population mean fixed with respect to time? That is, is there a variation of the population mean over a period of time that is, today the population mean says that the cost of a mobile phone should be 15000. That is an example you take, that is 15000 is the cost that people are ready to buy to prepare for a phone. Now if this 15000 remains the same for next year also or there will be a lot of changes in the next year.

If they say that there is no change in the next year or after 5 years or after 1 year they will be ready to pay 20000 and next year they will be ready to pay 25000 thousand. In such a case, we know that the mean actually changes over a period of time. So, if there is a change over a period of time, that is the mean and the population mean fixed with respect to time. Now, this is the change.

Suppose there is a change, then mean and the standard deviation are not fixed or the mean alone is not fixed, i.e., the mean value of that particular need changes over a period of time then we should go for a modular generation platform.

The mean value of the need is changing over a period of time which means that the customer preferences changes over a period of time. Then we will go for a modular generation platform. So, this actually comes from the previous analysis. We had an analysis of the mean value over a period of time and if there is a change over a period of time, we go for a modular generation platform.

So that you will be able to modify the current product for the next generation without making too many changes, so only a particular module or 1 or 2 modules need to be changed so that it will become the next generation product. We are looking at which need is changing and the module corresponding to that can actually be modified to get the new product i.e., the modular generation platform.

Now suppose it is fixed, there is no change in the mean or change is very small, not very significant then we can look at the sigma value. So, you know that the distribution can actually be represented using a mean and standard deviation. So, this is the μ and this is the sigma. Now you look at the population sigma, large, is the population sigma very large? So it can actually be like this.

So, the distribution can be like this also, that is, you still have the same mean but the sigma can be small. In this case the sigma is very small. We see that the sigma is very large. When you say sigma is very large, that means there is a lot of variation, though there is a mean value, but the requirement of the customer varies widely. So, that is what is meant by a large standard deviation. The sigma is large means the population has varied requirements. So, that cannot be said that, everyone is looking for the same kind of a feature, there is large variation within the population.

Then if there is no large variation, the variation is very small then we can go for a fixed unshared portfolio. So, you do not really need to go for a modular architecture because everyone is asking

for the same thing and there is not much variation in the requirements of the customer, then we do not need to have too many products in the market so we can actually have a fixed unshared architecture.

Because the requirements of the customer are almost the same and there is a large market for that, then we can go for a fixed unshared architecture. Now suppose there is a large variation, the sigma is very large, and then we look at it because when we say that large variation is there, that means there are people with various requirements. Then we look at what their segment sigma is and how each segment is performing.

Now we will be having multiple segments in the group so we can have out of this total population. We can actually find out different segments. And then we look at each segment, what is the μ for each segment. So, this may be one segment and this may be another segment and this may be another segment, so each one will be having a different mean and standard deviation. And that is why we get total population the sigma is very large and therefore do segments sigma equal to population sigma.

If segment sigma and population sigma are the same that means, the variation within the population and within the segment are the same then we will I mean, if that is a large variation, is there in population segment and segment sigma, that means even if you take a segment within the segment also there is a large variation so 1000 people you take, there is a large variation, and 100 people also you take people are not happy with the similar thing, they also have large variation that means there is too much of variation within the whole population.

So, if there is a large variation, then we go for an adjustable portfolio architecture because one product or a few products will not satisfy the people because each segment has again a large variation. So, one product or a few products will not satisfy you to go for an adjustable architecture that means you can adjust the architecture depending on the customer requirement.

Again, we have a large variation possible and that is not there if the segment sigma is not equal to population sigma, then we go for a modular product family. So, a modular product family will be preferred when the population sigma is very large, but segment sigma's are not very large,

segment sigma's are small that means you can actually identify segments where the variations are very small.

Then for each segment we will be able to produce products. That is basically we go for a modular product family. So, we can have few members in the family and each segment, each product will be designed in such a way that it can actually meet that requirement of a particular segment of customer. So, that is the way we decide the portfolio architecture of our product, I hope you got it.

So, just to explain once again, we look at the population mean, first we get all the information then see whether the population mean is changing over a period of time. So, if the population mean is changing over a period of time, it is clear that you need to go for a modular generation platform because today's product will not satisfy the customer in the next year or after 2 years so we need to have a modular generation platform.

And there is more variation then of course, you need to think of modular family products or modular architecture. Then we will see, look at the sigma, population sigma is very large. If the population sigma is very large, that means there is large variation within the population itself, then you cannot go for a single product or if the variation is very small, every all the people or most of the people are looking for a particular feature or a particular value in that feature then we can actually give that one only one product and then that can be made in large numbers.

Then we will go for a fixed unshared portfolio. The population sigma is not large. They are actually very small sigma, variation is very small then we go for a fixed unshared portfolio. Now, if the population sigma is large and the segment sigma is also large, that means there is large variation within the population and within the segment also, that means no product is good, no single product or not a few products are going to satisfy the customer.

In that case, we have to go for an adjustable portfolio architecture that means large variation within the group and within the segments. Therefore, we cannot go for a modular family, we need to go for an adjustable portfolio. And the segment variations are very small compared to the population variation, then we can go for a modular product family. So, this is the way we can

actually identify the portfolio architecture for a product based on the customer's requirements. I hope you understood. We will take 1 or 2 examples and then see how we can apply this logic to get the portfolio selected.

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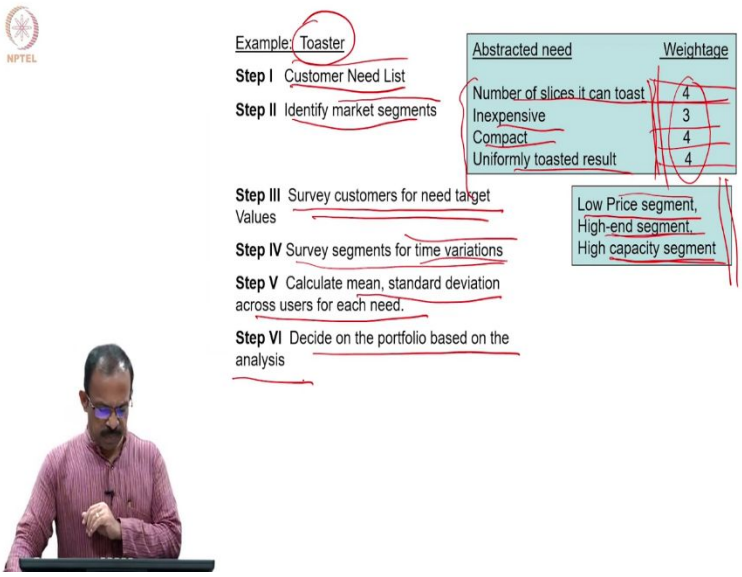

We will take the example of a very simple toaster, to toast bread especially a lot of use for such products. You can see that people will be buying a toaster for making breakfast most of the time. And suppose you are after completing your course, you go for a job and then you are staying alone or you are staying with your friends in an apartment. You would like to have breakfast in the morning, prepare breakfast and go to your work.

And the easiest thing is to have bread and I mean toast bread and then have bread and butter or something and then use it. So, you will be looking for a toaster so that you can actually quickly get your breakfast done. So, your requirement here is that you are not looking for a very high quality, good looking toaster and looking for something which will actually meet your requirement just to meet the requirements. You are not going to use it for a long time and you may throw it away after 1 or 2 years also.

You do not want to spend too much money for that and you are not worried about the quality of toasting and that somehow we do have to get it toasted, so that is may be your requirement as a

bachelor and or staying with your friends, but you take the case of a housewife who is actually having a husband and the 2 kids at home and she wants to make bread at home and for breakfast and she is also looking for a toaster.

And her requirement will be that she wants it to be a good one, good quality. She does not want to replace it very often. She does not want to repair it very often. She is looking for a very reliable, good quality product which will do good toasting also. So, her requirement is that even if it is slightly costly, she doesn't mind. She is looking for a good quality, good product. Maybe the number of slices 2 may be sufficient because the requirements are also not very huge.

And you take the same case of a hostel or a restaurant. They also need a toaster because they want to serve breakfast to the customers. Their requirement is that they would like to have a large number of slices toasted in a short time. So, the requirement is they want a number of slices to be toasted more and they do not mind paying money for that because they can always make it from the business. So, they do not worry about the cost.

They do not worry about the size of it. They can also be big. They would like to have it fast and good quality and number of slices also more. So, now if you look at the requirements of the customer population of toasters, you can actually see that there is a large variation. So, bachelor should be looking for something, Housewife would be looking for something, mess or restaurants would be looking for something.

Now, we need to see how we actually decide what kind of a toaster can be brought into the market or a company interested in introducing a toaster in the market. They want to know what would be the architecture of the product, which will actually meet that customer satisfaction. So, what they do is prepare a customer needs list. So, what are the important things the customer is looking for in this toaster?

So, this is from the point of view of the user's point of view, as well as for the designer to understand the requirements. So one thing, maybe the cost definitely cost maybe one important criteria. The second maybe the number of slices it can toast, the third maybe the quality of the

toast and the quality of the product or the output coming from the product and then maybe the size, maybe another criteria.

So, we need to identify all those customers' needs and then find out the variation of these needs also. Okay, so now we can take that is a number of slices it can toast is one requirement, inexpensive, compact and uniformly toasted result that is the quality of the toast. So, this can be considered as the need that you would like to take into consideration when we decide on the architecture and the weightage, which one is more important, which one is less important, so 4 is considered to be more weightage and 3 is less weightage like that.

Now we look at, how is this varying over for the couple population, customer population? So, we are supposed to have 1000 people interviewed. You want to take the population and then find out what is their requirement, each one. So, what is the requirement of the number of slices? What is the cost they are ready to pay? And what is the size they are looking for? And what is the quality of the toasting they are looking for?

So, this is what is needed from the market. And in this case, because a toaster is not something which actually changes its technology for a very short time, so we may not be really looking for the changes over a period of time. So in this case, it is not really needed because Toasters technology or the customer's requirement of a toaster is not going to change rapidly. Therefore, we do not consider the modular generation in this case and therefore we do not really look into the variation of mean over a period of time.

If you feel that a product requires that to be considered, then we need to definitely take that also. Now, identify the market segments so that is the next term, so we have the population and we need to identify the market segments. So, as I mentioned, the market segments can be considered into 3 or 4 segments, depending on how you want to divide the total population.

So, here I can say that those who are looking for a low quality product or a low income group or as I mentioned, bachelors and those who are staying in hostels or I mean, rented apartments, they will be looking for some product and housewives be looking for something and restaurants will

be looking for something so we can actually divide this group into mainly 3. First we call it a low price segment.

And then the other one is the high end segment that those who are actually looking for a good quality product, they are ready to pay a high price for that, that is the high end segment, mainly the housewives and family people. And then the high capacity segment, high capacity segment is the restaurants and mess and hostels and places like that. So, we can actually identify there are 3 segments in this case.

Now, what we need to do is to survey the customers for the needed target values. So, for each customer, we try to find out what their target value is. For example, you look at you ask all the people, so what is the price you are ready to pay? For low price segment, high end segment, high capacity segment, then you find out the total population also and find out what is the price they are ready to pay and what is the number of slices they are looking for and what is the size they are looking for and what is the quality of toast they are looking for.

And then survey segment for time variation, so if needed you can survey it for time variation. But in this case, it is not very critical. We do not really need to do but in general case we need to do the time variation also and calculate the mean and standard deviation across users what each need for each need you try to find out what is the mean value and standard deviation and then decide on the portfolio based on the analysis. Then you use the architecture that we discussed and then decide what should be the portfolio to be used. In this case, let us see how we can do this?

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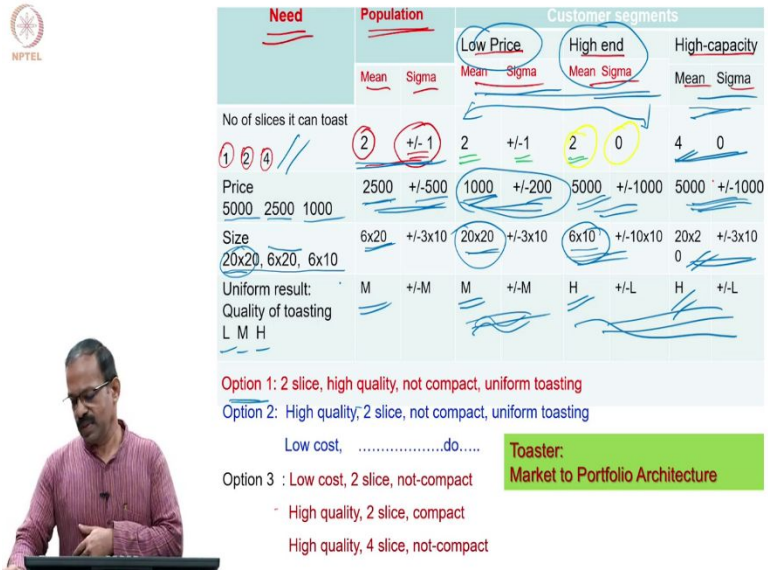

We will see that, this is the need, and then we will see the population, the total population will try to find out the mean and sigma that is the mean value and standard deviation and then we look for each segment, so the low price segment, high end segment and high capacity segment. For each one will try to find out mean and sigma values. And this we need to do for each need so let us take one need first need and see that number of slices it can toast.

We are saying that we can give an option of 1, 2 or 4. I mean, assume that you already suggested 1, 2, 4 all the customers based on their own requirement, but maybe we can identify the total, we can get from the total population. And we found that the population is actually looking for 2 and plus or minus 1. So, that is generally the whole population is asking for slice 2, so there is a large need for 2 slice toasters and the variation is not that high, but of course it is plus or minus 1. Somebody says oh one is sufficient for me, somebody says no, I would like to have 3 or 4. So, average if you take it, you will see that it is 2 ± 1.

If I plot it, I can actually say that it is like this. So, 1, 2, 3, 4 like this, so I can tell that this is the 2, this is the population mean, and standard deviation. Now you take the low price segment. So, the low price segment also says the same 2 and ± 1, so the low place, low price also is almost the

same 2 ± 1. And the high end segment says, the high end segment is the housewife and the family people, so they are also telling 2, their mean is also 2.

But then their sigma is very, is 0 that means they are actually saying that this is our requirement, that is the 2, but the standard deviation is 0. So, it is almost the same as a straight line here. So, that is the requirement. So, here they have 2 and 0 as the mean and standard deviation. Now, you come to the high capacity segment, they say that our requirement is 4 here sigma is almost 0.

It is almost straight, so they want only 4. They do not want anything else. So, we can see the high capacity segments says their requirement is 4 slices and high end segments says that their requirement is 2 but low price says that we are ready with the 2 ±. We do not really care about these 3, 4 or 2. And their requirement is, I mean they are worried more about something else.

So, this is the case for the number of slices. And overall population is two plus or minus one. So, we can see that the low price and high end will be happy with 2, but high capacity will not at all be happy with the 2 slice one. They don't really want to slice. They want only a 4 slice product which is very obvious because they are into serving more number of customers and they would like to have high capacity for the product.

So, now let us look at the other ratings. Now look at the price. So, now the price again, you can see the variation, so we can, suppose you had suggested you gave for 5000, 2500, 1000. Is that the range you suggested to the customer or the customer, based on the customers you can get the value but in this case, assume that the population, we can get this from the service. The population mean is 2500 with ±500 rupees.

So, suppose this is 1000, 1000, 2000 etc. 3000 to 4000 5000. So, the population mean is around 2500, ±500, so their requirement is something like this. So, this is the population mean, but the low price segment, the low price segment says that they are looking for only 1000 things. So, there are 1000 ±200. So it is almost like this. They have a 1000 as the requirement.

So, this is a thousand ±200. That is for the price of the product and here high end say they are looking for 5000. They do not mind paying a high amount for this. So, they have this around

5000. So, their requirement is like 5000±. So, they do not mind paying large money for this. So, their requirement is like this 5000 ± that is for the high end segment.

And high capacity also saying the same thing so, the high capacity segment also telling this is the requirement. Now you can see there is a clear differentiation between these two. So population, overall population if you take the mean values is 2500, but the low price is asking for a 1000 rupee product, high end is asking for 5000 and high capacity is also 5000 rupees. So, there is a difference in the requirement of the customer in this case that is the price.

Now look at the other things about the size. So, if you say that they can provide 2 I mean, 3 different sizes, one is a large size 20 by 20 the other one is 6 by 20 and 6 by 10, one is very compact 6 by 10 very compact is a medium size and is a large size. And you ask for the customers. So ,population you can see that they are only 6 by 20 is the requirement in the middle value and low price segment they do not really care what is a size 20 by 20 or 20 by whatever it is.

So, they are telling us we do not care about this 20 by 20 is also fine just then it becomes more and more small, the cost may go up so they do not want to increase the cost so they are ready to go for a non-compact type. But the high end segment, they are very clear they do not want to spend too much space in the kitchen for this. They want a very compact product, 6 by 10 compact product in the kitchen. So, they are very clear they want a very compact product.

Now high capacity they do not mind going for a big size one because the capacity is more important for them. So, they would like to have a high capacity one even if the size is big, they don't really care. So, that is the way we can actually decide the size of the product. Now the last one we will take about the uniform quality, quality of toasting.

So, the quality of the toasting we say that, low, medium and high. If I say low, medium, high as the toasting quality. So, the population says that the medium quality is ok and the low price segment also medium quality is ok but the high end says that it should be high quality and high capacity also says it should be high quality. You like to have a high quality product to satisfy

these two customers and these customers say, I don't really care even if it is a medium quality toaster because as I told this customer segment is not really worried about those things.

They are only very worried about the cost of the product that is why they do not really care even if the quality is slightly less. But the other two segments really ask for a high quality product. I mean the toast. Now, we have all this information with us now we need to take a call. How do we actually decide the product, the number of products or if you, again, there are few other things also need to be taken into account.

How many people are there in each segment or if the segment size is very small, then probably it is not worth going for a product to satisfy that customer segment. So, looking at all those aspects again, you can actually take a call on how many products to be there and what should be the architecture of this product.

Now, if the company decides to have only one product in the market, assume that based on the financial aspect, they decide to have only one product in the market. What should be the architecture that they should choose for that product, what should be the slice, what should be the price, etc.? So, if it is only one suppose they have only one option as a one product, then they should try to go for a 2 slice product and a high quality one, not that compact, but uniform toasty.

So, this will actually cover these two segments very well, low price and high end segments can actually do this because they are providing 2 slices and are high quality, so this high end segment will be happy and not so compact. So, if they make it very compact, the price will go up. So, they do not want to make it very compact so that the prices can still be suitable for the low price segment also.

And toasting quality they will make it uniform toasting quality. I mean, that is a high quality toasting. So, this will actually meet the requirement of all the customers. And if they can actually have a pricing which actually meets the customers of both the segments, then they will be able to sell the product so that is the first one they can actually think of. So, they will decide to have only a 2 slice product not a 4 slice. So, definitely this segment will be out of their market. So,

they cannot really sell it to the high capacity segment unless maybe few will be able to sell, but not a large market for that in this case.

Suppose the company decides to have two products. So, what they do is, if they have option two, they will decide to meet these two segments because of the low price and high end segment, they would like to meet with two different products, one for the low price segment and one for the high price segment. And still they will not get into the high capacity segment because that market may be very small and therefore they feel that this will be the best option for these two high quality 2 slice and a low cost 2 slice product. And that will be actually meeting the requirements of the customers and then if they have 3 options, of course, for each segment they can have one product.

So, one product for the 4 slices and one for the other 2 segments 4 slices and 2 slices, one high quality and one low cost. So, this way, the company will be able to meet the requirements of the customer population by introducing 3 products in the market. I hope you understand the way it is done, so look at the population mean and standard deviation and segments, mean and standard deviation and then decide how many products would be the best thing. Again what if I were going to have 1 product, what should be the architecture if there are 2 products, what should be the architecture that can be decided.

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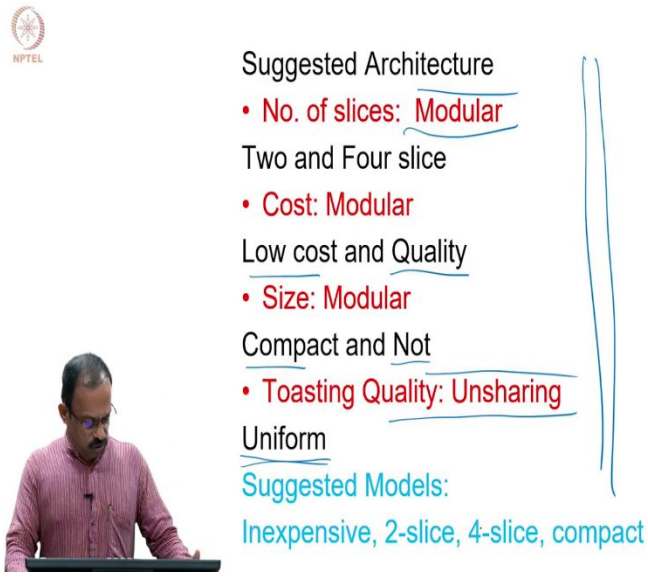

So, finally, if they have products then we will actually get it. Suppose the number of slices, so will they make the slices as modular one because if they have to offer 3 products in the market. We need to have a modular architecture for the product since the number of slices we can have 2 and 4 as one module, one with the 2 slice module and the 4 slice can be made as a module.

And similarly, the cost can be a low cost and quality product. So again, that can be a module so that the same platform can be used in one that can actually put low cost components and one they can have high cost, high quality components so you will get two products and then size can be modular again, compact and also not so compact. So again, I have two sizes and two the size of the product can be one and can be very compact, one can be not so compact.

So, this can be assembled and other modules can be assembled into this compact or not so compact structure. And finally the toasting quality they make everything uniform so they because everyone is looking though the one segment is not really looking for high quality. It is better to provide high quality because they do not need to make it 2 modules or the single module they can make it or they do not need to make it as module one, they make it as unsharing.

So, in all this it will be quality will be the same for all the products. So, this will be the suggested architecture for the toaster. So, I will be going for a modular architecture except for the quality which will be on unshared architecture. So, we will take one more example, which is the suggested models, inexpensive, 2 slice to 4 slice and compact so you can actually have products like that.

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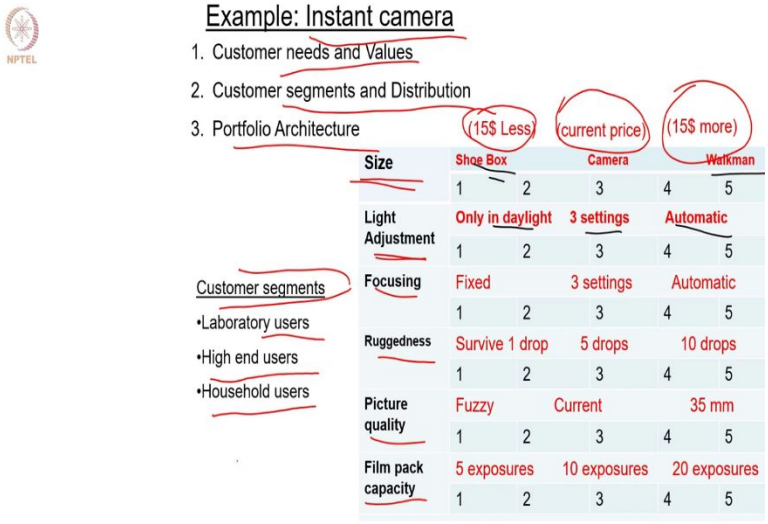

So, inexpensive 2 slices, 4 slices and compact for products, I mean within this can have variants of the products to meet the customers' requirements. Let us take one more example which is actually for an instant camera. Most of you must have seen the instant cameras, though it was not, it is not very popular nowadays. It was very popular a few years back. And then again, it is slowly coming back in the market.

So, we look at the requirements of this camera and then see how the architecture can be decided. So, as we do the customer need analysis, needs and values, then the segments and distribution and then look at the portfolio architecture. So, in this case, we can identify 3 market segments. One is the laboratory users who will be using it for taking the photos of experiments or the output which is coming out of experiments. So, it is more of a scientific application.

The other one is for the high end users who are ready to keep one for their home and then they want to take it with them for very, many professional kinds of applications. And others are the household users. They are not very high end users. They are very mean, they do not want to spend too much money on that but still they would like to have something like that, that is the customer 3 segment of customers.

So we can actually look at these 3 segment customer segments and then identify the variation in their needs and values. So, we look at the needs. So, we will say that the size, light adjustment, focusing, ruggedness, picture quality, film pack capacity and the style. So, these are the customer's needs and we say we will tell the customers that, look, we can actually provide you with a current price, these features in the product and we can provide you one for some 15 dollars less and then 15 dollars more, you will be able to get this kind of a feature.

And ask the customer, what actually the values will be. Now if you say that size, would you like to have a very small one, big one with the size of shoebox size or you want a Walkman size small one. So, you can actually get the values. So, they know that if they have to go for this, they have to pay extra and if they go for this, the price will be less compared to the existing one. So, that is the one then you get the value from the customer.

Similarly, light adjustment only can be used only in daylight, can have 3 settings, or it can be automatic, completely automatic. Again, when it is completely automated, you have to pay extra for that. So, this way you will be able to get for this one, focusing. You can have fixed or 3 settings or automatic ruggedness, 1 drop, 5 drop or 10 drops, then picture quality fuzzy, current and 35mm good picture quality as film pack capacity 5 exposure, 10 exposure 20 exposure style is ok, current style, modern style and very outdated style.

So, you are giving the option to the customer to say that, now this is what we can actually provide, you tell me what actually you want ok for each one of these sizes, what is the size you want? What is the focusing? What is the light adjustment? What is a picture quality like that you need to tell? So, this is what I'm actually looking for. Now, if you do a survey and collect all this information, then you will be able to get the customer segments in the distribution. So we know

the segments, the 3 segments, and for each segment we will be able to get the distribution, the mean and standard deviation.

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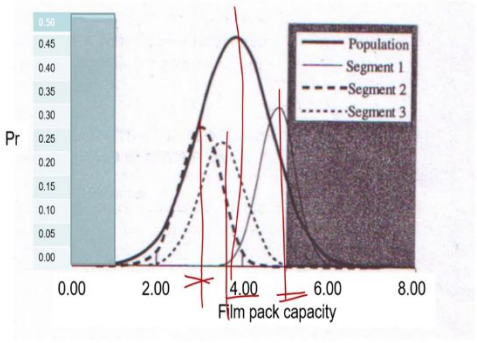
Population and Time Distribution of Instant Camera Needs

	Population		Laboratory Users		High end users		Household Users	
	Mean	Std. Dev	Mean	Std.Dev	Mean	Std. Dev	Mean	Std. Dev
Size	4.333	0.816	3.533	0.516	3.700	0.949	3.800	0.632
Light Adjustment	3.667	0.724	2.533	1.187	4.600	0.843	3.300	0.483
Focusing	3.933	0.961	3.000	0.000	4.600	0.843	3.900	0.876
Ruggedness	3.533	0.990	3.333	0.488	3.000	0.000	2.800	1.033
Picture quality	4.267	0.704	3.267	0.458	3.800	0.422	3.700	0.949
Film pack size	3.800	0.862	4.800	0.414	3.000	0.471	3.500	0.527
Style	2.923	1.188	3.000	0.000	2.700	0.675	3.800	1.317



So, if you assume that this information is given to you, so we are not going to see how to get all this information, you can see this will be the population mean and standard deviation. This will be for the laboratory users. And this will be for the high end users and this for the household users. So, we can get this information, now based on this information, you need to take a decision on what should be the architecture so you can take each one of these and then try to

analyze it and then decide what will be the requirement of the customer. So, I will not be going through all this requirement. We will take one or two unique requirements then see how to analyze this. For example, you look at the focusing.

So we have this focusing, you can see that the laboratory users, this is segment one there requirement is 3 and 0 that the mean is 3 and 0, so you can see this is the laboratory users, so they are very clear what they want. They want only 3 focusing is 3 and no other changes needed, that is the only thing they are looking for. But if you take the population, you can see a large variation, the mean and standard deviation, I mean, the mean is somewhere here but the standard deviation is very large, sigma is very large.

And segment 2, the segment 2 is this there requirement is 4.6, so they are very clear this is 4.6, so this is the 4.6 they are looking for and their sigma is 7.8. So we can see that this segment has a mean of 3, this is what a mean of 4.6 and this has got a mean of 3.9. So, you have a mean of 3.9 here. So, this is 3.9. Now, if you are offering a product, you have to decide what need you should be focusing on?

Can you provide a single focusing, I mean, single value for focusing or you need to have different values for the focus. So, by the way, looking at this, you know, the population is 3.9, but if you provide 3.9, this segment will not be happy. So, probably you need to provide one for three for laboratory users and probably the other one, 3.9 or 4 maybe satisfying these two segments.

So, this is the way you need to look at it. So, one product with 3.3 and probably the other one with 3.9 will be a good option so that is the way how you need to look at the distribution. So if you similarly, if you look at the filling capacity, you can see that this is the population mean, but then the segment means are completely different, each one has got a different mean?

So here you have 3, this is close to 4. And this is a 5. So, the film pack capacity requirement is, there is a lot of variation between the segments, so that is again. So each one, each one of these would be able to analyze like this and then get the distribution. Now looking at all this, we can say that the size can be.

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Architecture Recommendations for Instant Film Camera Features

Customer Need	Architecture of Choice
Size	Integral
Light Adjustment	Fixed and Adjustable
Focusing	Fixed and Auto-Focus
Ruggedness	2 Model modulator
Picture quality	Integral
Film pack size	3 model modular
Style	2 model modular

	Population		Laboratory Users		High end users		Household Users	
	Mean	Std. Dev	Mean	Std.Dev	Mean	Std. Dev	Mean	Std. Dev
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So, let us look at the focusing. So, as I told you focusing, you can have one fixed focus and one autofocus because the fixed focus is basically for the laboratory segment which actually they were looking for three and others are four point six, three point nine. So, maybe you can actually provide one autofocus and one fixed focusing that can be an architecture for the focusing part. So, it can make the focusing as a modular one and one will be fixed focus and other will be autofocus.

So, if you predict some product, you can have this as a one module for the focus. Similarly, you can see the light adjustment, film pack capacity. So, film pack capacity as you can see all the three segments are looking for 3 different capacities. So that was the film pack cronies for 4.8, one is 3. The other one is three point five. So, whether to provide three film pack capacity for the product that is why 3 models are modular.

So you can have a three model modular one here. And picture quality, everyone is almost looking for good qualities, so you can have an integral quality for all the product so everything can be integrated. So, you do not need to make it as a module so it can be throughout the product that will be throughout the family it will be the same so that is the integral one. Similarly, size also you can write an integral one because everyone is looking for almost 3.5, 3.5 range.

So, it can be common for all the same size to be used. And a few things like in this case light adjustment, focusing then ruggedness these things will be modular. So, you can have these as modules and you will be able to make the product. So, this is how we look into the customer segment values customer segments and their distribution in order to decide about the sorry architecture of the portfolio architecture.

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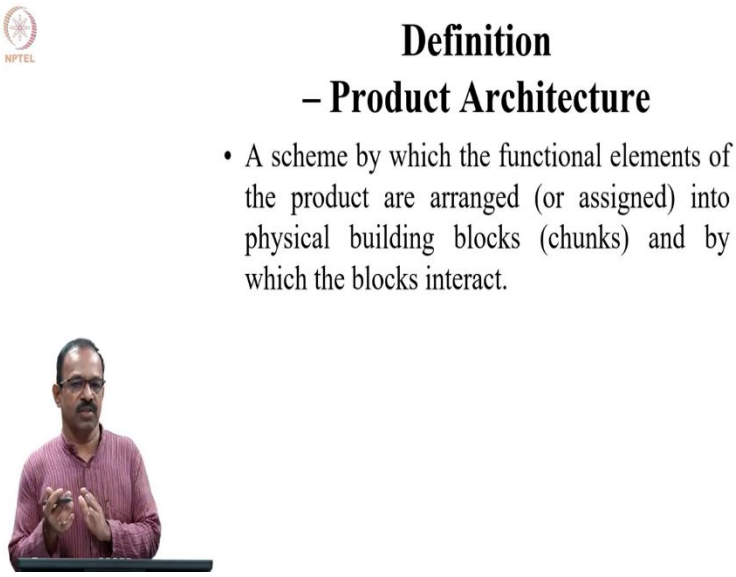

So, this actually talks about how we decide the portfolio of a product based on the customer needs and the distribution of these values of these customer needs across the population as well as across the segments, you will be able to analyze the variation of this requirement. And based on the architecture suggested and the algorithm that we discussed, will be able to decide what will be the portfolio of products and then what will be the portfolio architecture for the product.

So, that is about the portfolio architecture, about the family of products. Now in the next class we will see how the individual products can be decided or what the architecture of individual products can be decided based on the conservation of the portfolio as well as other aspects of providing the customer satisfaction. So, we will stop here, we will continue this in the next class. Thank you.