User Interface Design
Prof. Saptarshi Kolay
Department of Architecture & Planning Engineering
Indian Institute of Technology, Roorkee

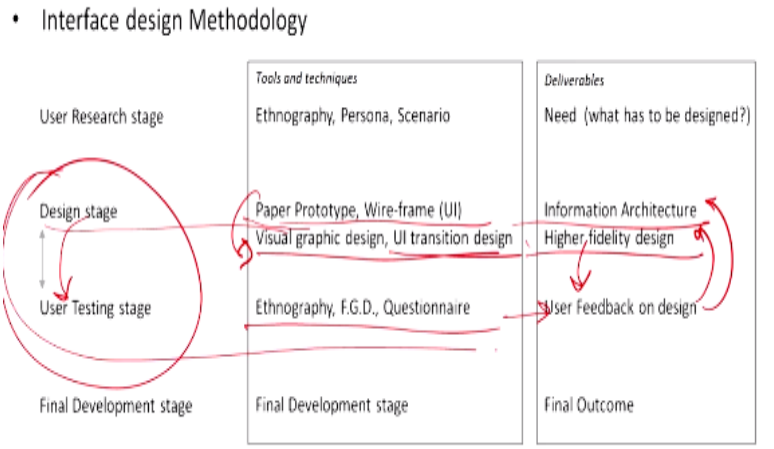
Lecture - 18
User Testing - I

Hello students. Welcome to the online NPTEL course, User Interface Design. So in the previous class we have discussed, we have completed the low fidelity as well as the high fidelity design where the visual communication designers will come into picture to create the high fidelity design. So now we will discuss about how the user experience designers come into picture and do the user testing.

So this testing is not necessarily has to be done after creating your high fidelity design. So it is better to do the testing as quick as possible when the paper prototype or the low fidelity design is ready and it might be there are different options, different versions of low fidelity design so which we call multivariate design. And after that we do the user testing again the first time and then we go for the high fidelity design.

So that nullifies that minimizes the elongation of the process or the error of design. So more we do the testing in the early stages the better it is for going to the final design.

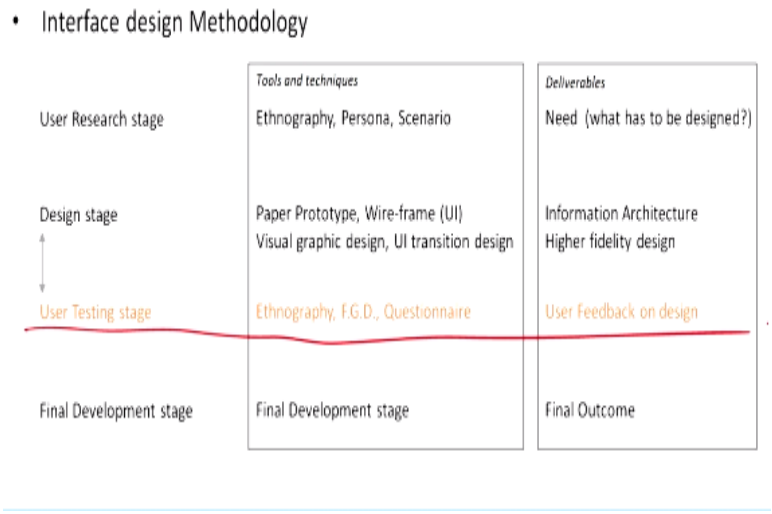
(Refer Slide Time: 01:49)



If we look at the process, so the iterative part of the design comes. So it is not a linear process like the waterfall model. So it is the iterative model when it goes back and forth. So in the design stage when we do the paper prototype and wire-frame and the information architecture it can come for the user testing where the ethnography, focus group discussion, questionnaire, these are the different tools and techniques and user feedback is required, is taken, and it changes, based on that information architecture can be changed.

And then we go to the high fidelity design where graphic design, visual graphics are added on top of it and UI transitions are there. And then to create the high fidelity design we again go for the user feedback through user testing method. And again it goes back. So this is the iterative part of the design which we will be talking about.

(Refer Slide Time: 02:44)

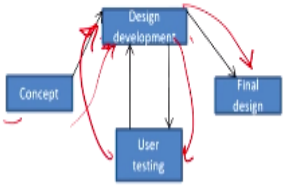


So today we will discuss the user testing process, tools and techniques and how the feedback is taken.

(Refer Slide Time: 02:51)

- Interface design Methodology

Iterative model: involves user feedback and through iterations can again go back to design development stage, incremental design process



So when we look at the method, so this is the iterative model of design which we have discussed earlier. So the concept, from concept, design development and from design development it directly does not go to the final design. It comes back for the user testing and then again the development happens in different stages and then when the users are satisfied and achieve the required user experience then it goes for the, it is called the final design.

(Refer Slide Time: 03:20)

- Interface design Methodology

Double Diamond method:

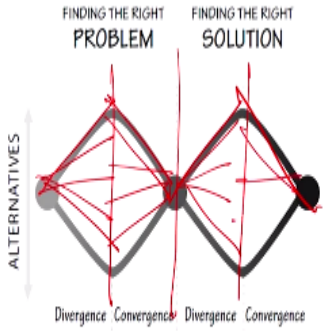
Initially proposed by the British Design Council, 2005.

Discover

Define

Develop

Deliver



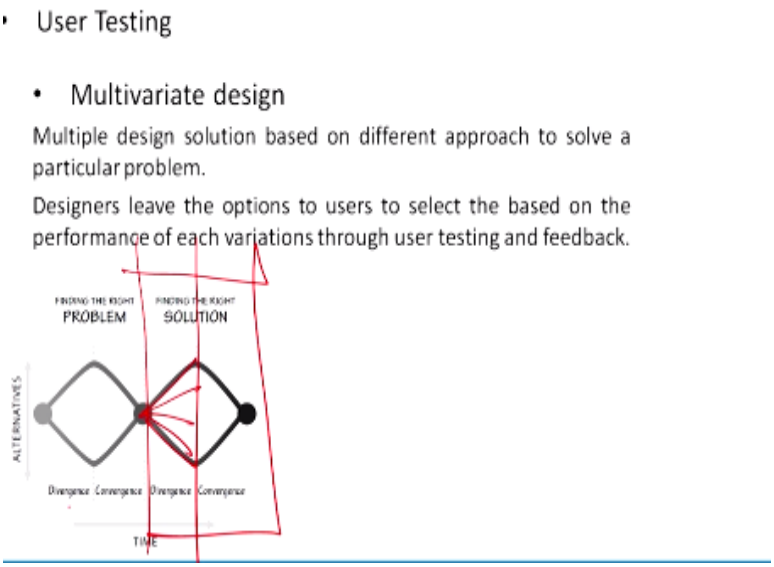
Donald Norman, Design of Everyday Thing

So we also discussed about the Donald Norman's proposal of double diamond method in his book, Design for Everyday Thing and so the interface design methodology looks like a double diamond when there is a divergence, convergence and again divergence and convergence and in

this process of divergence we create multivariate design and then through user testing the user research we come to the optimum research question or the design problem identification.

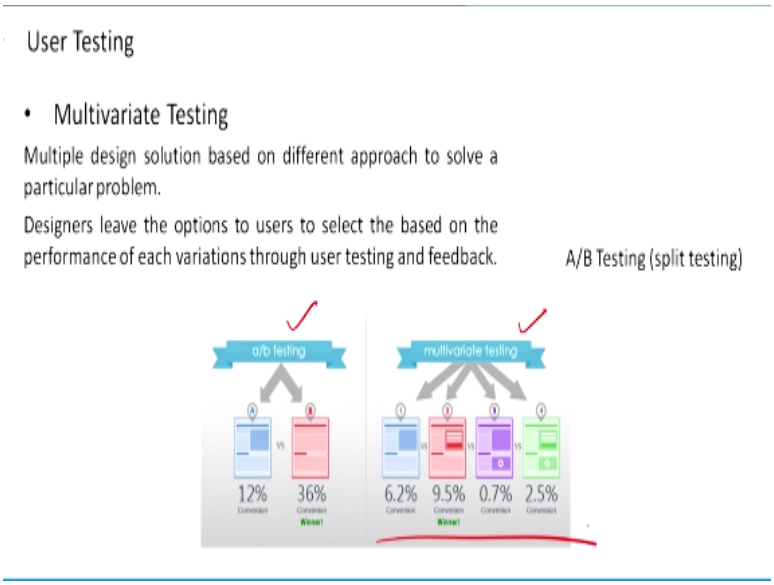
And then again we create multivariate design and through we user testing we select the best possible option.

(Refer Slide Time: 03:59)



So in this process of creating multivariate design, this process of double diamond method we create a multivariate design in the second diamond which is the solution and here and this multivariate design should go for a testing so that we can find out which solution works best for the required user experience and the target audience of the user.

(Refer Slide Time: 04:29)

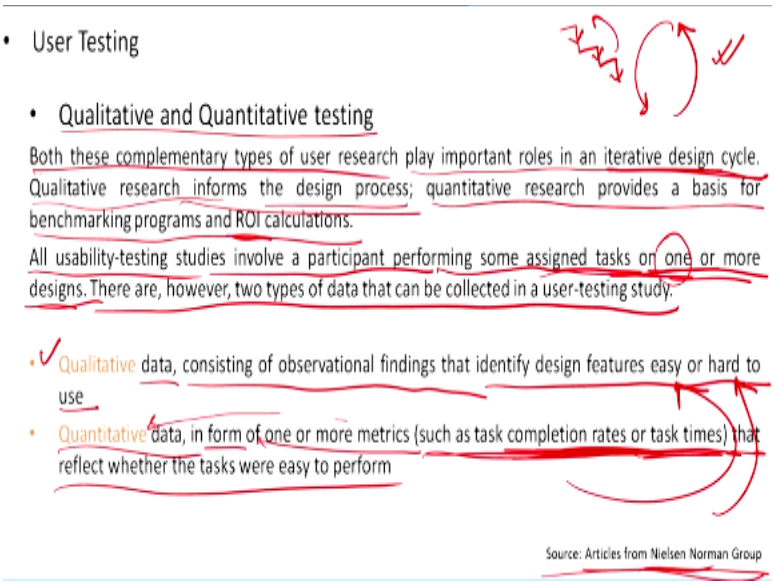


So here we create this multivariate testing and A/B testing which we have discussed briefly earlier. So multivariate testing and A/B testing is or the alpha beta testing is similar. When multivariate testing we create multiple different variation and A/B testing we create only 2 variations. So this is just a number, if we create 2, so it is A/B testing or if you create multiple variations this is multivariate testing.

So A/B testing is a kind of multivariate testing or the split testing so which we have discussed earlier. So we will also discuss about the other techniques of user testing. So user testing can be broadly categorized between qualitative testing and the quantitative testing. So all this other tools and techniques will be facilitating either qualitative testing or quantitative testing or both. So today in this class we will discuss about the qualitative testing and the quantitative testing.

In the next class we will continue discussing the user testing and we will focus on the tools and techniques for this kind of testing. So qualitative and quantitative testing is the different typology of testing and many of the cases, they can even overlap.

(Refer Slide Time: 05:43)



So for this discussion the article is taken from the Nielsen Norman Group's article whose Jakob Nielsen's blogs and articles are there. So we should definitely go and read the blog and he is one of the famous pioneering user experience designers and he have write-ups on this articles on his website. So qualitative and quantitative testing both of this are complementary type of user research or testing technique which plays an important role in the iterative design cycle.

Where in the iterative model we apply the testing, not in the waterfall model of design where there one step is done and then there is no go back to the previous stage. So this is the new model of design which is iterative design cycle. Qualitative research informs the design process. Quantitative research provides the basis for the benchmarking programs and return on investment calculation.

So quantitative research generally looks for a large number of sample size where statistical method is used to analyze the data and mostly the user feedback will be based on some quantifiable numbers. So their feedback and experience will be translated into some numbers which will be a very tangible outcome of how users are feeling based on some mathematical numbers and for creating a mathematical correlation we definitely need a larger sample size.

That is why quantitative research you get a larger sample size of user and qualitative research informs a design process and it might be target to very few people and where we try to

understand the user psychology. So this is more of a psychological research which is qualitative research and we try to understand what people are thinking. Sometimes most of the cases of qualitative research it will be a long interview and their experience.

And we let them speak and how they are feeling about the product, in qualitative testing model when they are talking what is the meaning behind it. So this kind of codifying a particular word is more important. So this is more subjective and the researchers perception of what users are talking about, that is more important in qualitative technique of testing. And in quantitative testing it is dependent on the numbers.

All usability testing studies involve a participant performing some assigned task on one or more designs. There are however two types of data that can be collected in user testing study which is qualitative and quantitative and definitely there has to be a task which has to be assigned or one or more designs. So when there is one particular variation of design so it is not a multivariate design.

So when there is a one concept which is going for a testing, so this is one concept testing and then more designs which is the multivariate testing or the A/B testing is there. So in qualitative data, this consists of observational finding that identify design features easy or hard to use. So whether it is easy to use then the experience will be delightful. When this is hard to use then the users experience, the users will feel anxious.

And there will be more cognitive load on the users and then the experience would not be delightful. So basis on that, so qualitative research only gives an idea of how whether it will good experience or bad experience. But qualitative research is very important to understand what users want and what their need is. So there are lot of soft codes which users can give which might not be feasible for quantitative research.

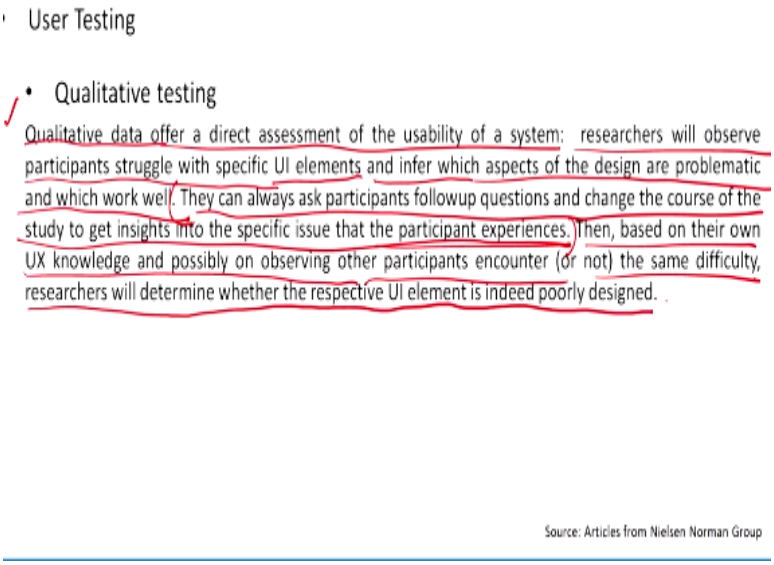
That is why qualitative research should be done in the early stages of design to understand to ideate the design and lot of salient features and needs of the users can emerge from the qualitative research while talking to the users in a long discussion or the qualitative method. In

quantitative data, it informs of one or more matrix such as the task completion rate or the task time which are quantifiable whether the completion rate can be whether it is completed or not.

So there can be a number assigned for that or a percentage of people who have completed the task and the time. So time also can be recorded, for this particular task how much time people take on an average. So all this quantifiable data can be part of the quantitative research technique. So this reflects whether the tasks were easy to perform or not. So through that quantitative data also it feeds to the easiness or the hardness of the task which is design for.

So they lead to a similar kind of analysis but the process is different and the way the experiment setup and the questionnaire will be designed in qualitative research and quantitative research are different.

(Refer Slide Time: 11:16)



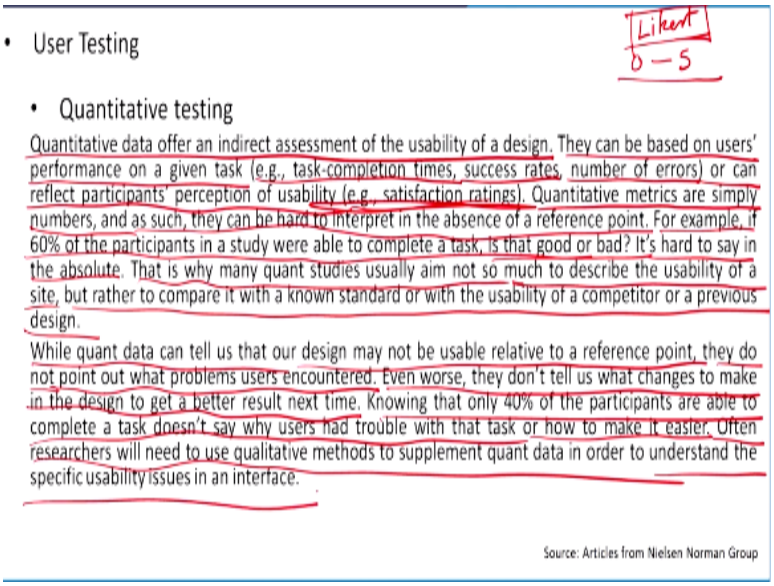
So the qualitative testing is the qualitative data when we take, it offers a direct assessment of the usability of the system. Researchers will be observing the participant's struggle with specific UI element and they can infer which aspect of the designs are problematic and which aspect of the design work pretty fine. So they can always ask participants follow-up questions and change the course of the study to get insight into the specific use of the participant's experience.

So this is very important part of the qualitative testing which quantitative testing does not enable designers to do that. So when there is a new thing which can be found through qualitative data, so the moderator who is moderating the testing, so they can change the course of the testing and some new questions can be added which is the follow-up question when there is a new direction and they can shift the direction of the testing.

And some other kind of question can come so that they get more insight of the real need. So even through the qualitative testing they can find different kind of needs which they might be missing out throughout the design process. That is why qualitative design can give more insight, different directional insight in the testing process. And then it can also be subjective and the experience of the users can be recorded through the verbal discussion.

Then based on their own UX knowledge and possibility on observing other participant's encounter or not with the same difficulty researcher will determine whether the respective UI element is needed or poorly designed.

(Refer Slide Time: 13:10)



So in terms of quantitative testing, quantitative data offers an indirect assessment of the usability of the design. They can be based on user's performance on a given task. For example task completion time or success rate or the number of errors. They are within the task flow or can

reflect the participants perception of usability that is satisfaction rating. But satisfaction, it cannot be in quantitative testing they cannot just talk about their satisfaction with their own expression.

So there has to be some rating. So it can be 0 to 5 scale rating or any rating. 0 to 5 scale rating is the Likert scale. So Likert have first introduced the scale of transferring a qualitative idea of the satisfaction rate. So that satisfaction rate while using the product is a very qualitative concept. But when users are putting this satisfaction rate in 0 to 5 which is the number or it can be another numbers which they are putting into so that qualitative concept right now is transferred in the quantitative number.

So that can also happen in the quantitative testing. So satisfaction level can also be transferred like that. And then through the large sample size this numbers can again statistically can be calculated to achieve the satisfaction rate for the particular product. Quantitative matrix are simply numbers and as such they can be hard to interpret in absence of the referred point. For example if 60% of the participant in a study were able to complete the task, is it good or bad?

So that is a very difficult to interpret. So that is why designer should blend qualitative with the quantitative testing and both should then lead to a particular decision making. Because for a particular user they might give a less number for their satisfaction rate and for some other user they might tend to give higher value of a satisfaction rate for a similar kind of experience. So that is why quantitative research testing requires a large number of user within the sample size so that to nullify the error of these kind of judgment.

So larger the sample size in quantitative testing, the better it is. But for qualitative research sample size is not required. More of a in-depth talking and in-depth analysis is more required in qualitative testing. So it is hard to say in absolute what is the number exactly mean. So that is why many quantitative studies are usually aimed not so much to describe the usability of a site but rather to compare it with a known standard or with the usability of a competitor of the previous design.

So generally it is better to test, go for a quantitative testing for a multivariate design either so if there are a few options created and then similar kind of users were given those options and then they start rating, then it can be a comparable rating. So if 60% participants are satisfied for product A and 70% are satisfied for product B then product B is better than product A. Or option B is better than so vice versa. And also it can be used to benchmark the other products.

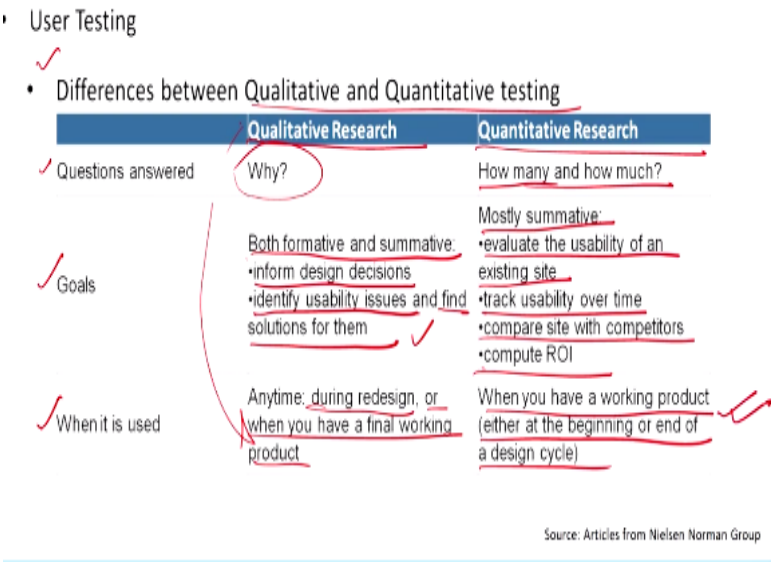
So it can be compared. The design product, how design product is performing in respect to the other existing product which is available in the market. So that comparison can be done with the quantitative testing because this numbers can be better to compare. But number can be difficult and can be misleading while to understand whether the performance is, in a isolated system whether the performance is quite good or not.

While quantitative data can tell us that other designs may not be usable relative to the reference point, they do not point out what problems users encounter. So that exact problem and what they are thinking during that problem. So these are difficult to interpret during the quantitative testing. Even worse, they do not tell us what changes to make in the design to get a better result next time.

Because they will not be, users will not be telling that this might work in a different way which provision is there in the qualitative testing where the moderator or the designer can take a follow-up question and lead to a different direction which can enable the designers to understand different direction of design. Knowing that only 40% of the participants are able to complete the task does not say why users had trouble with the task or how to make it easier.

So for that we need qualitative testing and often researchers will need to use qualitative method to supplement quantitative data in order to understand the specific usability issues in an interface design.

(Refer Slide Time: 18:38)



So if we look at the differences between the qualitative and the quantitative testing, here the differences are, so qualitative research and the quantitative research are shown in the tabulated format. So questions, answers are generally why in qualitative research which enables the users to take a follow-up question, so why when users will answer this why, so they can give their own opinion and they can tell what can be the probable solutions and what are they looking for.

Which can be noted down by the designers and they can take a different direction of a design totally from what they were thinking in which line they are thinking at. And quantitative research will be how many and how much which leads to a number which can be analyzed statistically. Then goal of this qualitative research is both formative and summative. So when they form towards design and then they sum up to the final design.

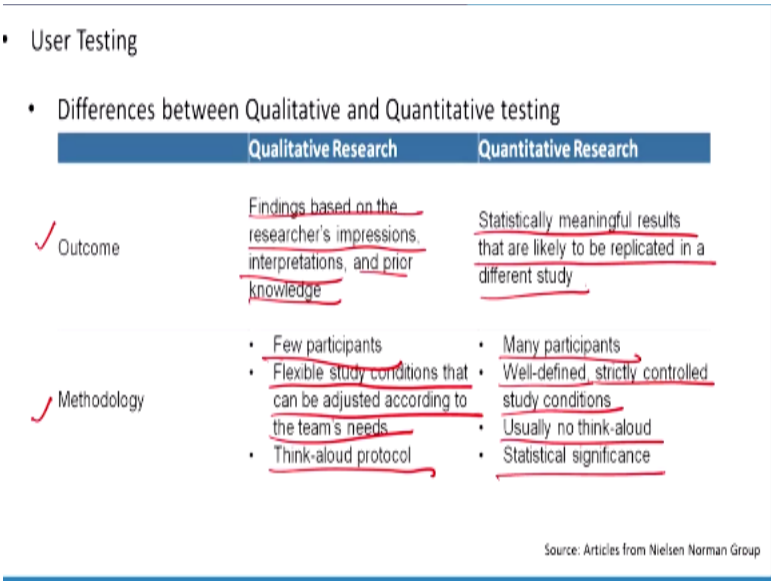
So this is a formative design of the initial stages when they lead towards a particular design and they seek for a design and then they sum up towards a final design. So the inform design decisions whether the decisions are good or bad or there can be new different direction of decisions. Identify usability issues and find solution for them. So they are better to find out the right solution which might not even be there in the multivariate design options.

Mostly it is summative which is evaluate the usability in a existing site, tract usability over the time and whether the usability is what is the performance evaluation of that whether how many

percentage of people are able to cope up with the task. Compare the site or the competitors and compute the return on investment. So if 60% people are able to complete the task so then among the target audience, 60% users might continue to use that.

So that gives the idea of how much return on investment can be. So this is definitely not a right figure but it gives a idea to the company that how much return they can get on the investment. So when to use this particular research technique qualitative research can be used anytime during the redesign or when you are finally working for the product and quantitative research can be used when you have a working product either at the beginning or the end of the design cycle. So generally this is more of a comparative analysis of 2, 3 existing product.

(Refer Slide Time: 21:26)



So outcome of the qualitative research is finding based on the researcher's impressions, interpretations and prior knowledge. So those play a very important role in qualitative research. So it is based on the impression, interpretation and the prior knowledge of the researcher's or the moderators or the designers. This is statistically meaningful results that are likely to be replicated in a different study.

These quantitative methods are statistically analyzed when we get a particular data. So here the interpretation or the soft understanding or decoding a meaning what users have said that does not require but more of a statistical analysis and mathematical analysis is required for quantitative

research. The methodology is it can happen with a few participants, qualitative research. Flexible study and condition that can be adjusted according to the team's need.

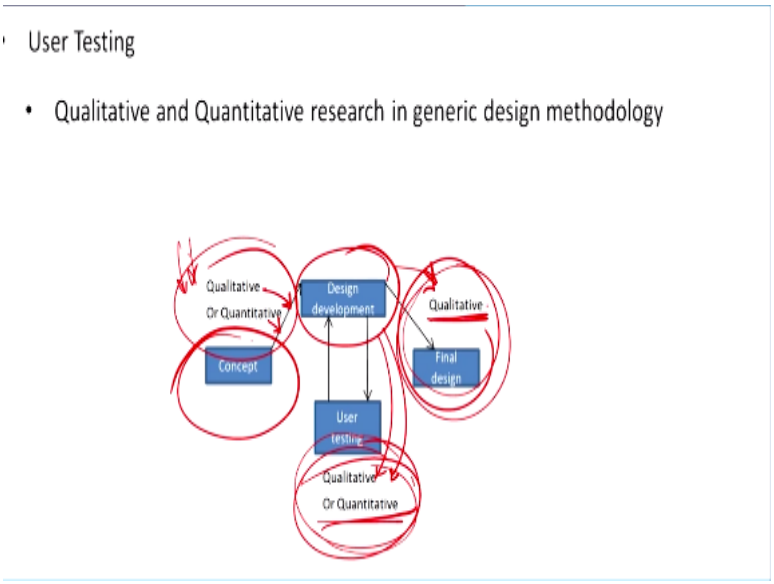
So there can be different follow-up question. Even the setup can be different. So some qualitative research can be done in a virtual setup. Some qualitative research with some user it can be done with a real setup and some can be done with a different other setup because we are not comparing the numbers between different user group. So different variety of setups, variety of user groups can be deployed in the qualitative research where designers try to understand different direction of interpretation by the user.

So this is more vast and incorporate different typology of study and different typology of setup. And here quantitative research we go in-depth and we go for many participants and a well-defined setup. So we cannot compare and tabulate the data of a different user groups qualitative research and club them together because their numbers and based on the setup and the user's persona, the number will be different.

So for one particular setup there has to be a lot of user group and then we can club those numbers and formulate a particular number for the satisfaction rate of a particular setup. So we cannot club different scenarios together. So it is well-defined, strictly controlled study condition. We cannot deviate from that so that the number's meaning will also deviate. And usually no think-aloud process is done in quantitative research technique.

But think-aloud process is done in qualitative research. So when they are thinking aloud then users are talking about their experience and why they are doing it so those helps the moderator or the designer to lead towards the different direction but think-aloud process is not required in the quantitative research because we are looking for a number and which can be statistically meaningful and statistically formulated.

(Refer Slide Time: 24:27)

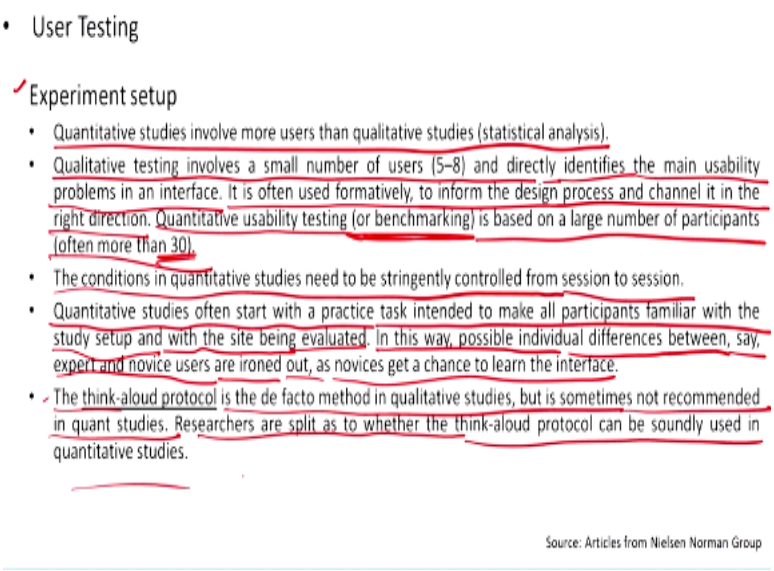


The qualitative and the quantitative research in generic design methodology how do they come into picture when the design concept is there we can deploy qualitative as well as quantitative method to understand the user to do the user research. For the qualitative research we can understand why this is required and answer those why's. And through the quantitative research we can understand how many participant will be, how many users will be using this and how many what amount of return on investment can be there.

And then we can start with the design deployment and then again qualitative or quantitative research user testing. So this is the user testing process of quantitative and qualitative thought. So this is the user research and this is user testing. So in user testing also again we can deploy the qualitative and quantitative method and when we do the final design.

So we have already compared the existing product and we have existing product where quantitative method can be used and we have already compared the multivariate design which designers have created and compared it through the quantitative research. So for the final testing and the validation, qualitative research can only help. Because there is one final design, so one design can only be useful in the qualitative method of testing.

(Refer Slide Time: 26:01)



So now we will talk about the experiment setup in qualitative as well as quantitative research technique. So in the experiment setup qualitative studies involved more user than the quantitative study. That is because it requires statistically analysis. Qualitative testing involves a small number of user. Generally it is 5 to 8 or it can even be 15. And it directly identifies the main usability problems in an interface.

So it is often used formatively to inform the design process and channel it in the right direction. Quantitative usability testing or it is mostly for benchmarking, benchmarking with the existing product with the design idea. Or it can be the comparative analysis between the multivariate design. This is based on a large number of participants, often more than 30. And more the number is better the research will be.

The conditions in quantitative studies need to be stringently controlled and cannot be changed from the session to session. Quantitative studies often start with a practice task intended to make all the participants familiar with the study setup and they will not deviate from that and with the site being evaluated. And it will be totally controlled and for each and every participant they will be in the same environment and they will do the same task.

Otherwise we cannot compare and club the data through the feedback of the users. In this way possible individual differences between them for example expert and novice users are nullified

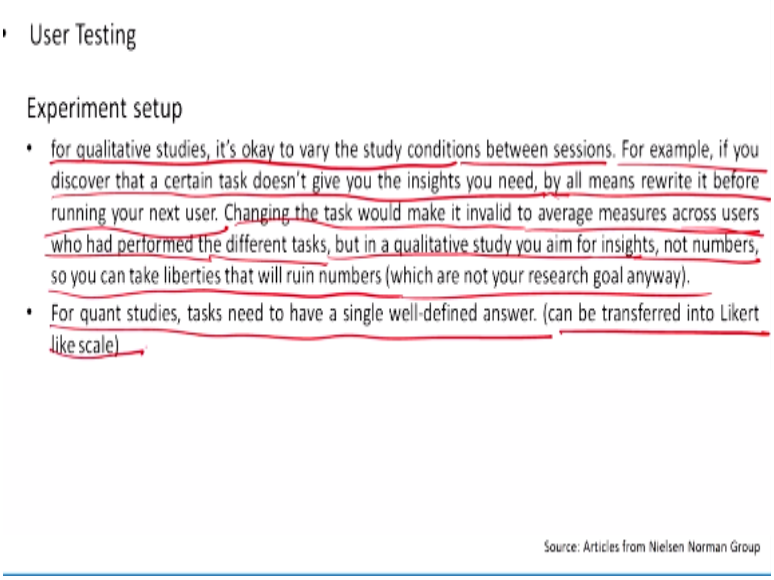
and novice gets a better chance to learn with the interface. The think-aloud protocol is while users are using or going through the testing or they are using the design product, the designer ask them to say what they are thinking.

So if they are thinking about okay I will click this button and then they are expected to launch on the different page, so they will say that. And if they are not satisfied they will say that okay I am having problem here. I am not going to use it. And they will constantly say what they are thinking. So that designer will tell them that whatever you are thinking you should always talk about that.

So this process is involved in the qualitative research and not in quantitative research because in quantitative research it will be just the number of the satisfaction level. So in the qualitative research, when they are talking, so that is how designers are recording their satisfaction level whether what they are feeling and in quantitative research when users are feeling the Likert like scale or giving the satisfaction rating that is how designers are evaluating the satisfaction rate.

So the think-aloud protocol is the design facto method in qualitative studies but it is sometimes not recommended for the quantitative studies. Researchers are split in their opinion whether the think-aloud protocol can be used in quantitative studies but mostly it is not required and in qualitative studies it is definitely required.

(Refer Slide Time: 29:31)



So the next thing is for qualitative studies it is okay to vary the study condition between the sessions to understand more different opinion, more different scenarios and to get a wider range of view of the particular product. For example if you discover the certain task does not give you the insight you need then you change the task and change the scenario. By all means rewrite it before running your test users.

So changing the task would make it invalid to average measures in case of quantitative technique across the users who had performed the different task. But in qualitative study you aim to for insights not number. So you can take liberties that it will ruin the numbers but you will get a different point of view. For quantitative studies task need to have a single well-defined answer. Can be transferred into a Likert like scale or the rating system.

So in the next class we will discuss about the tools and techniques of the user testing and which can be both applied for qualitative and quantitative research.