User Interface Design
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Lecture - 03
Design Methods - I

Hello students, so welcome to the online NPTEL course, User Interface Design. Today we will talk about the generic design methodology for user interface design and gradually from the next class onwards we will detail out the each and every design stage of user interface design. So if we see the all other design domains of broader perspective rather than just concentrating on user interface design process if we consider the visual communication design, other creative domain as well as industrial design, furniture design and other design.

So the holistic umbrella if we consider that, so that research and design technique can be divided into 6 major categories into that domain.

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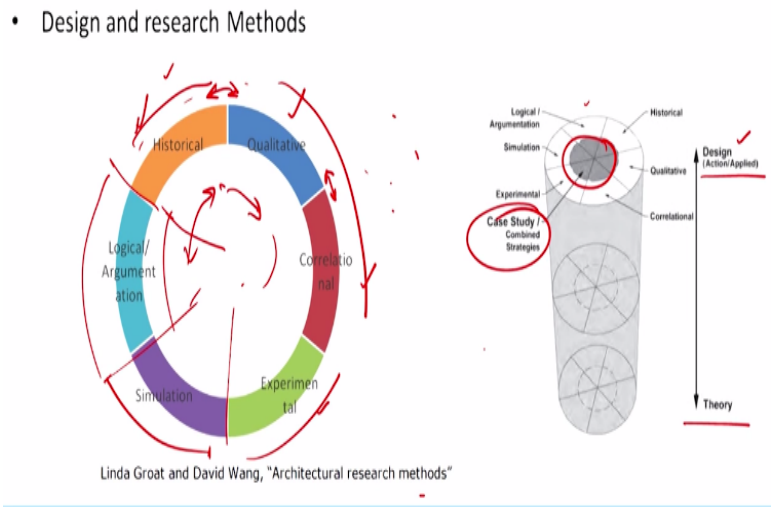

So if we see, so this diagram has been taken from the book Architectural Research Method by Linda Groat and David Wang, though it is focused on architectural research method but the different typologies can also be true for any creative domain for example other industrial design UI UX and visual communication design domain. So this is the broad 6 category and there is a fine difference between design and research.

Design, in a broad way design is more applied and research when we go into more theory based. So the same techniques can also be research related or it can be design related. So when it comes to theory that becomes research and when it comes to be more action or applied then it goes towards more into the design method. But we can see the all 6 methods are there. So let us start from here. The first is historical research.

So this is very qualitative research when we dig down the what happened in the history. For example if we do visual communication design uh research, so we are talking about all this research method and design method to give you a better understanding of what all other approvable process can be. Sometimes in UI UX also these process can also be applied if there is a certain particular different context.

So in historical research what happens is what happened if I give you an example, for example if you want to design something based on a past visual style which is not contemporary. For example if you want to design some web portal in Gothic design style or some for example art nouveau style. So you need to find out what are the art nouveau style which was there and you have to base your research on lit review because we do not see many examples of art nouveau around us.

It can be any other design style which is not visible today. So this research technique is mostly qualitative and you have to find out what happened during the past and based on that you take design decision. Qualitative is another research method. So I am terming this historical research as qualitative because the nature of the research. But qualitative is another kind of research technique according to Linda Groat and David Wang.

Where we try to understand phenomena and of user behavior or through phenomenology and ethnography. So those kind of research are qualitative. Most of the user experience design research is qualitative research. When we try to find out the user behavior, their cognitive psychology, what do they think and how they can behave if we present this kind of information in website. So what will be their probable behavior? What will be the probable action?

So these kind of research comes under the qualitative research. The next is the correlation research and when this segments are creating the circle, so these consecutive research techniques has lot of similarities. And in terms of technique, in terms of methodology and in terms of deliverable they have some similarity. That is why they are placed in this order. For example in historical research we use the qualitative method and it is more descriptive.

And when I discuss this correlation research technique, so this is also similar as qualitative research where we try to find out what can be the behavioral perspective in two different scenario. So it is same as qualitative but we are correlating two different variation, two different scenarios of qualitative research. So if this is the case, case 1, this might be the behavioral outcome and if there is a case 2 what will be the behavioral outcome?

And then we compare between the case 1 and case 2 and then we judge what kind of whether case 1 will be better or case 2 will be better. Sometimes your UI UX design can also be correlational when we create multivariate scenario. We will discuss that later. So multivariate scenario is when we create different design for one particular solution. So we give users option A for the same, which solve the same particular problem.

Option B which is the solution of same particular problem, but two different solution. And which solution, which design or which web portal works better, we find out that and we relate these, why this is working better and then gradually we iterate or we do the minor iteration or major iteration based on the performance of two design and that can be termed as a correlational research in terms of UI UX design.

Then experimental research, experimental research might not happen directly in the web based design. It might happen in the case of if I give you an example of suppose some scenario is created in augmented reality which is not there. So that kind of in hypothetical situation some experiment, if we set up an experiment for example how people might behave in a disastrous situation for example evacuation of a flight.

So that situation can be created in virtual reality or augmented reality headset and then how people are behaving within that situation. So that is an experimental setup. So this is not a real setup. So qualitative and correlational are real setup. Historical is a real setup which happened in the past. That is why we go into lit review. Qualitative and correlational are real setup. Within the real setup how people are behaving.

And when we are giving them web application, so we are judging their in the paper prototype or whatever we are giving them, the product, they are interacting with the product. But experimental it is like virtual setup when we conduct a experiment within a typical virtual setup and we collect the data. That is a experimental research. And simulation research is more, an experimental research sometimes the data can be collected by user.

So there is a user behavior might be intertwined with the experimental research. And simulation research generally does not happen in UI UX design because it might be totally devoid of human behavior. So simulation is totally data centric. It is most of the cases in physics and more science related research will be there. In some cases it might be there, where we are simulating some through a software and software gives the data and all the comparisons are happening in the software.

So mostly the human datas are not there. Maybe in few cases the eye tracking data and this can be as a simulation but there also human perception comes. So simulation research is not very related in terms of UI UX design. And then the logical argumentation. This is a very theoretical research where the designers give a theory totally devoid of the other, it is more of a top down approach where designers give a theory based on his perception.

So it is not, users are not coming in this research method. So this is more of a giving a new theory. For example if this is a style and design style going on what can be the futuristic style and there may be users might not give much opinion on that what will be in the future style or something. And it can be some other things where logical argumentation is totally based on logic and argumentation and it is also very much qualitative in nature.

So this is the spectrum and some research can also be a combination of few research techniques. So there is another one which is case study and combination strategy which can be combination of different various segments of this 6 major segments. Now coming down to the main UI UX design methodology. So earlier there was a waterfall model which was previous concept where each and every design step is followed by one step and there is no going back.

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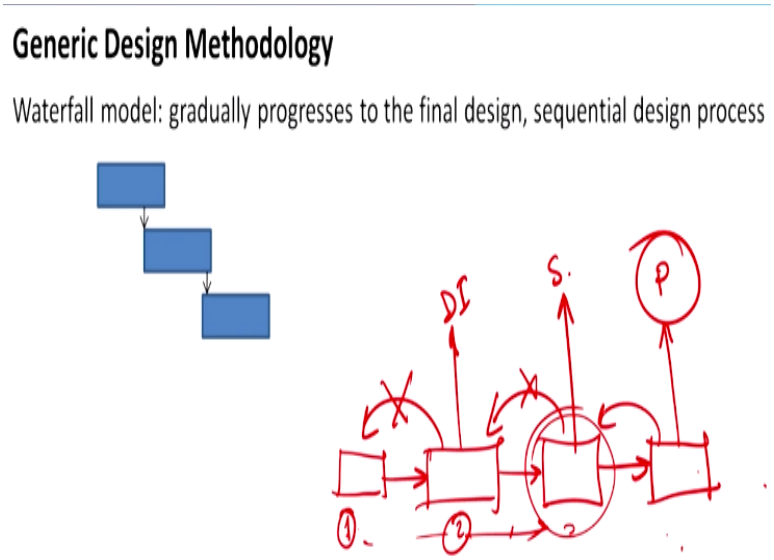

So there is a linear process. So it is not a complicated process when there is no 2 way processes are not happening. So a stage 1 happen and then it will be stage 2. So when stage 2 is happening, so they will not go back to stage 1 to correct something and when the stage 2 is done it will be stage 3 and so on so forth. So for example if I give an example in UI UX design, so first when we find out the user need. So this is the requirement for the website. So that will be frozen.

The requirement will be totally frozen and the next stage will be based on this requirement what can be designed and in that stage the deliverable will be the design idea. And the next stage the design idea will be frozen, design idea. And the next stage based on the design idea the solution, design solution and the low fidelity solution or the first level of solution will be ideated and that will be frozen from the designers part.

And then it will directly go to the computer science of the developer and they will develop the software, the final software or the final product and it will be frozen and it will be ready for the

market. So that was the process earlier. But there were less probability of this final product to be successful because there was no iterations happening based on the testing and how this is performing.

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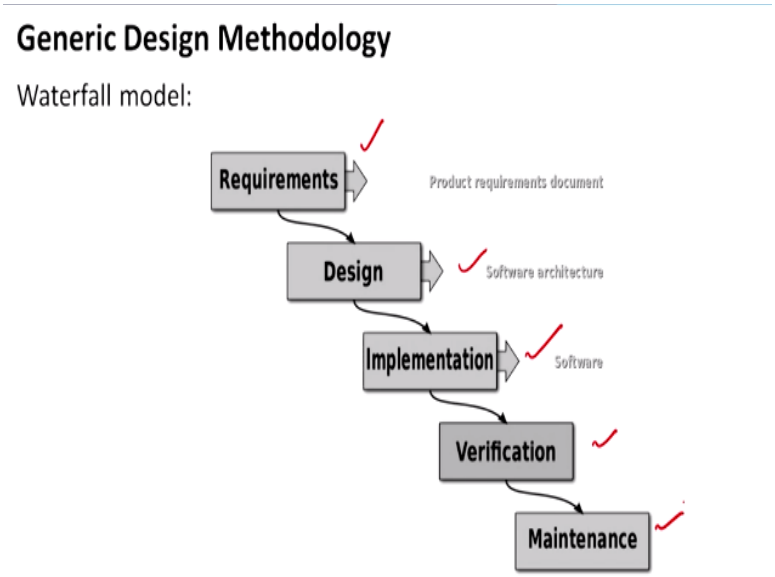

So this was the model requirement, then design, the software architecture. Then implementation, verification. If this works and then they will maintain it and it will just go on.

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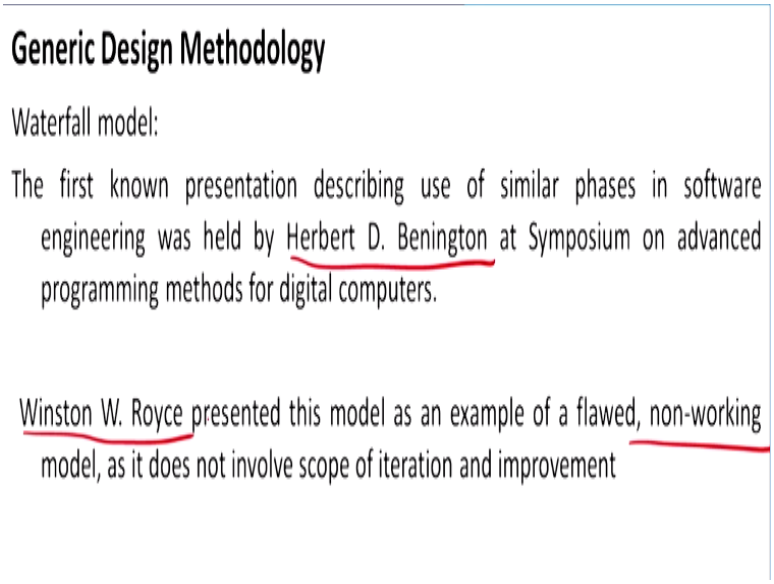

So this first known as this is by Herbert Benington first told about this. He is a software engineer. And it was proved that this was not working by Winston Royce said that this process does not

work properly in the situation. There can be a better process to ensure when the product launches the market it works better.

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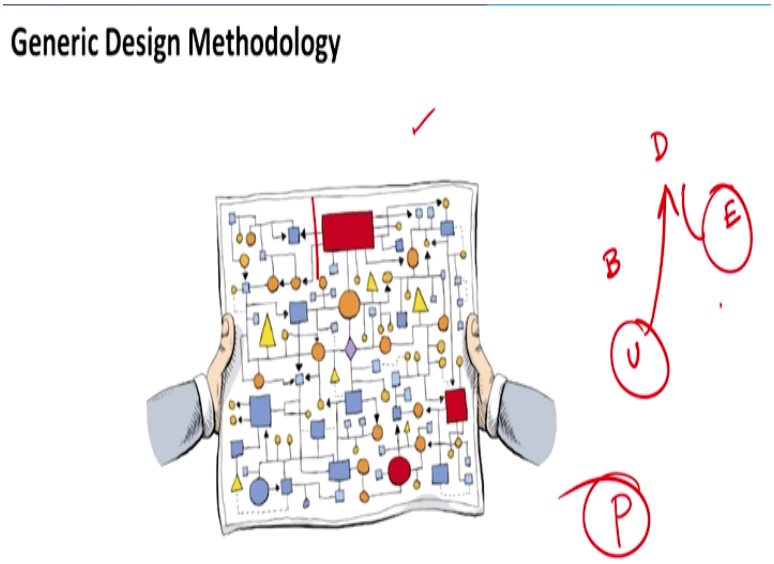

So the ideal design process is not linear. So it is very complicated because there are many stakeholders. Designers are there. Then programmers or developers are there. The client is there and if it is a not a B to C communication or the business to client then there will be many layers of client. So if it is B to B with whom you are talking to, you will not be the final client. B to B is business to business. And then you have to find out the final client who will be the real user.

So user will be somebody else. So the designer is there. This engineers are there, the software engineers; the business provider and the client or the users are there. So there are lot of different stakeholders going on. So there has to be a provision to collect everybody's opinion and everybody's idea and design should be, the final design or the final product should be, we should ensure that this product does not fail.

Because right now in this UI UX design or the product design when a product is launched, so lot of money has already been gone for this to create that product and to iterate that and when it launches the market the final version or the alpha or beta version, the final version, so lot of money has been already invested by the business. So if there is any fault, so business has lot of risk involved in the product. So to ensure that whether the product does not fail and the risk of

failure comes down we have to ensure that this product performs properly with the market. So that is why voice of customer or the user's opinion, engineer's opinion and everybody's opinion to design the product is very much important.

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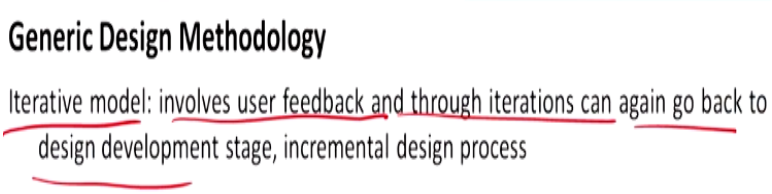

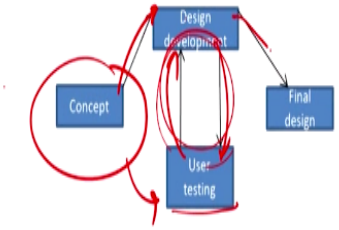

So that is why this new model, iterative model has been designed. So this iterative model talks about, this involves user's feedback and throughout the iteration it can again go back and force. So there is a loop created. So within that loop it revolves several time until and unless it satisfies the customers. So there will be set of customers, few customers will be selected for the user testing and the product will be tested in several layers.

When this is in the initial stage, the idea will be tested. The next stage, the low fidelity or the mock up prototype will be tested and it will be ensured that this product when finally designed will be will work is satisfying the user need. Whether it is satisfying or not, how the users are performing, are reacting with the product, product's interface that will be notified and based on that minor iterations or the major iterations will be done.

So after the concept, concept sometimes also goes and for the user testing. So from concept initial design development happens and it goes for user testing and then next layers of design development with iterations or some tweaking happens and then it goes on until and unless it

satisfies the user's need. It totally follows the user need and the best possible solution comes as the final design.

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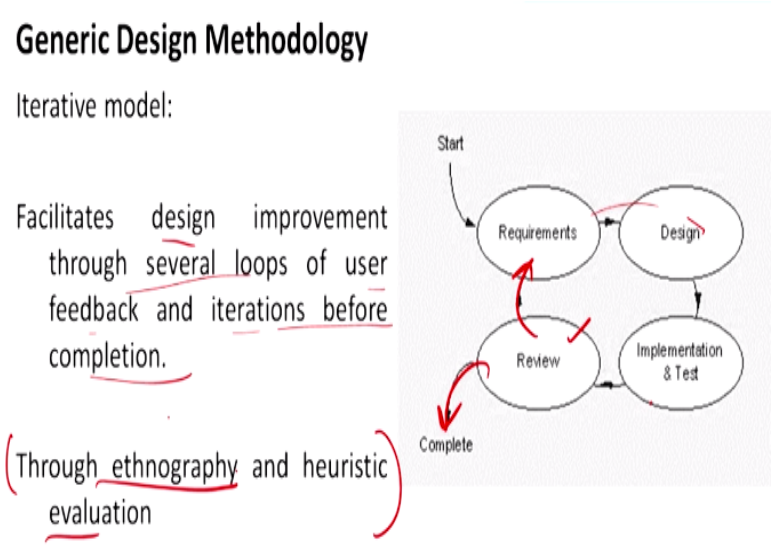

So this is like a loop. So it starts, then requirement, design, implementation, test, review and if the review is satisfied it is complete. If it is not satisfied then the requirement again can be reformulated. Then design and then test, it goes on like that. So iterative model facilitates design improvement through several loops of user feedback and iterations before completion. So this loop you might think that if there is a one-one process and it goes back, the process is shorter.

But when it comes within the loop, the process might be longer. It might take longer time because finding out the users and testing it takes longer time and the money involved will be more. But it ensures, it reduces the risk factor and it is proven that the product which has been designed in this process works much better when it is launched finally. So finally the benefit or the breakeven actually happens quite before.

The breakeven is when the amount of money invested to create the product and that equal amount it is gained by the investor or the client. So that is the point of breakeven. So breakeven happens much before and the chances of failure is much less. So through the ethnography and heuristic evaluation this process will be done. So ethnography the broad term is like ethno means people and graphy to survey people in their real situation.

We will discuss the ethnography in terms of user experience design focused on this web application interface design when we discuss the detailed methodology. And heuristic evaluation is when we, ethnography is the first stage when we study the user to formulate the need. And heuristic evaluation is when we do the user testing, that process is heuristic evaluation. So we will also discuss these two methods when we discuss the user testing and user feedback analysis and user need generation.

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So few of the processes which ensures this iterative model is card sorting. Users will be asked to sort the card based on it might be different variations of prototype or their requirement. They can talk about their requirement, their need. So which will be validated by designers whether what they are thinking the users need is matching or not. Sometimes through this process of user survey different latent needs comes up which designers did not foresee.

And sometimes user also talks about their desire which might not be the primary need but different desires. For example if you think about a refrigerator, refrigerator is for a cooling purpose and then some refrigerator has the sixth sense, ice comes out from the door. So these are different desires which is not the basic requirement but some other added advantage. So if you take the example of mobile phone, mobile phone initially started with a device to connect, to contact with people who are remotely placed.

Now mobile phone includes everything. Mobile phone is a amalgamation of wrist watch. It is also, they have provisions to see videos, chat with people and watch movie and what not. So it started to amalgamate different desires which was not the basic need for the mobile phone but later it changed, the equipment changed. So right now if we think about a mobile phone we think about a smart phone and that includes a lot of things which was earlier not part of the initial concept of the mobile phone.

So also we think about affinity diagram. This process will be discussed in detail when we discuss the major segments, each and every segment in detailed fashion. So affinity diagram is when we discuss this need and desires. So many of the needs will be superimposed with each other. So they will be similar. Many of the needs will not be similar. So we create affinity diagram, so what are the similar needs, similar requirements.

And also during the testing we do what are the why these things are getting this prototype is not performing, why the other prototype is performing better. So based on that we create this affinity diagram. These are different techniques to ensure voice of customer how we analyze, how the user gives the feedback. So these techniques are part of iterative model which was not there in the waterfall model.

When we talk about the iterative model, so there was also one of the pioneering designers gave this concept of taking voice of customer in the industrial design first.

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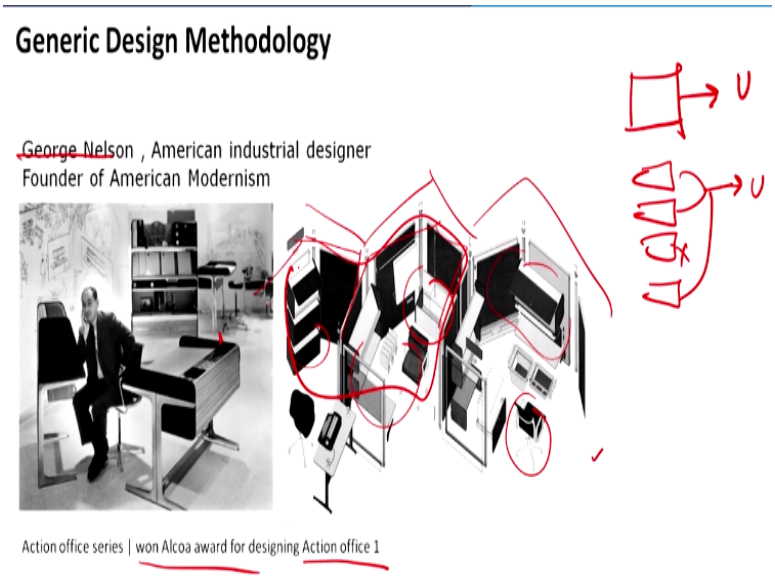

So he is George Nelson, he is a product designer. But this concept came from him in the quite early situation because product design was, the domain product design came before web design and web designer interface design came is much newer as a domain. So George Nelson was a famous industrial designer. He is the founder of American modernism. He gave a concept of modular office furniture when he was thinking about a free plan.

And the office furniture has to be customized based on each and everybody's need. But it should also be mass produce. So he gave a very interesting idea of mass production and customization where user can change and select based on their particular need, based on their requirement but the basic system will be quite similar. So designers are offering larger plethora of different design options, design solutions and users are selecting them.

So here if you think about the concept, designers are not giving a concrete solution to the users. They are not feeding them a particular solution. They are giving them multiple solutions and users have the provision to select or deselect different solution to create their final product what they need. So the voice of the customer or the voice of user and their opinion is amalgamated within the final design.

So finally how the design will look like that depends on the designers as well as the user. So this is also called the codesign process. So the different stakeholders are creating the product, they

are co-creating the product. So if you look at his first office furniture design, so this is, this won the Alcoa award and this Action office series 1. He have designed different other series, series 2, series 3 based on the requirement of the office and the need of the office.

So you can see these are the different cubicles. They occupy the same space. Their basic look is the same. So they go in the holistic situation. They do not look out of the place. Everything has a visual simile. But still based on the requirement of different people, it is changed. So you can see the sitting arrangement is different and the setups are different in this cubicle. The setups are different in this cubicle. They have minor differences in this cubicle.

And when there is a module, so two modules can be amalgamated to create a bigger cubicle who has a higher rank or has more work to do and so on so forth. In totality this will be under, this is something like the process where user's feedback is created. So this is not exactly a process where this is going as a loop of iterative design. But this is designers are giving users multiple options to select and users will select.

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Generic Design Methodology

George Nelson , American industrial designer
Founder of American Modernism

Concept of free floor and modularity in furniture, partition and storage wall
Approach of problem solving instead of aesthetic style

So there are some other examples by him. So George Nelson is the, he have written a book by Tomorrow's house. In architecture also the similar process has been taken. So there is a studio apartment and users can select how the apartment's partition wall will be. And based on that he

have designed a partition wall. This is the first partition wall design and we can see the modular kitchen, modular wall cabinet in today's houses.

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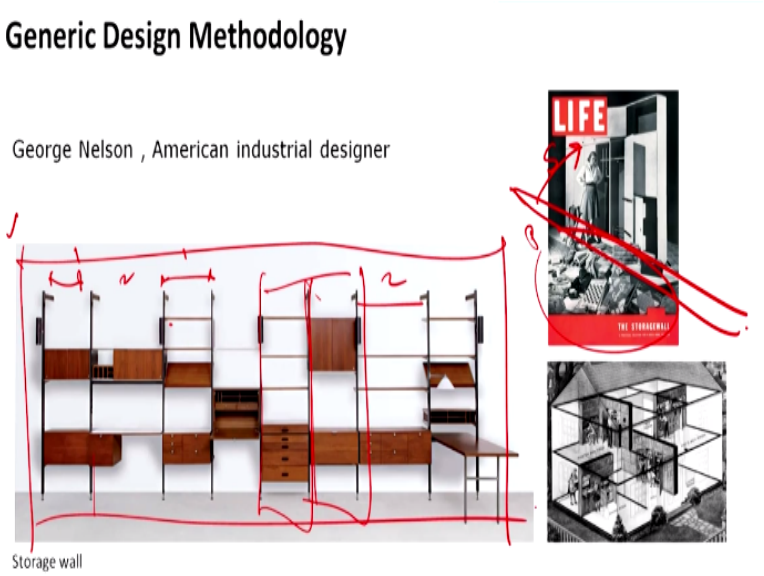

But this is his first time when he gave this concepts. So this was the problem how everything is scattered and this was the solution, how it can be done as a partition wall. And if you look at the partition wall, this is again a modular design. So this length is one module, this length is the other module. So you can select different sequences and whether you will go for this or this variation within this another module.

And how many divisions you want, this is totally dependent on the user. So the final wall cabinet how will it look like the designers are not giving the solutions. The users are taking it. So here in this case, the provision of success rate will be much more because users are creating their solution based on what do they need. In many cases of user experience design in product designer, visual communication design and even in few cases, might be in application, user might it can be open to the user how do they want to personalize their setup.

In case of some web application or software designers might give some provision of customization to the user. So that will work better and the users will feel personally attached with the design if they have customized based on their need. Because everybody's need is different.

So targeting a larger segment of customer will be much more easier and everybody has the provision to change according to their need.

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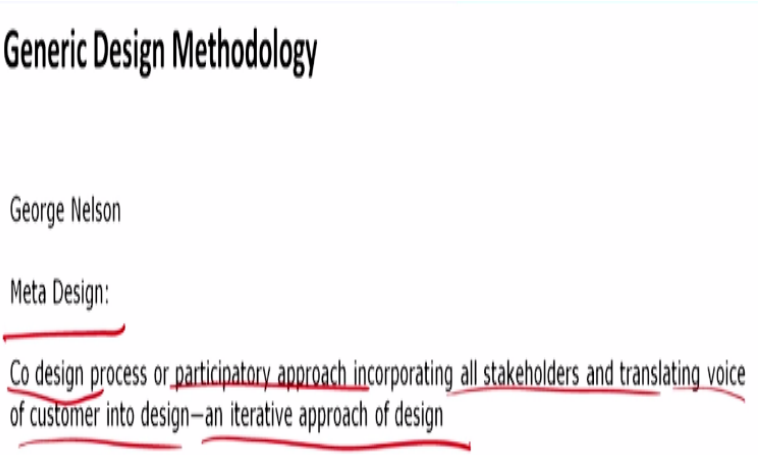

So this process during that time, George Nelson connoted this as a meta design. So this is also a co design process, in today's term these terminologies are similar. Or participatory approach incorporating all the stakeholders or translating voice of customer into design. You can say this is a iterative approach of design where they are iterating but this is mostly a co design animated design process.

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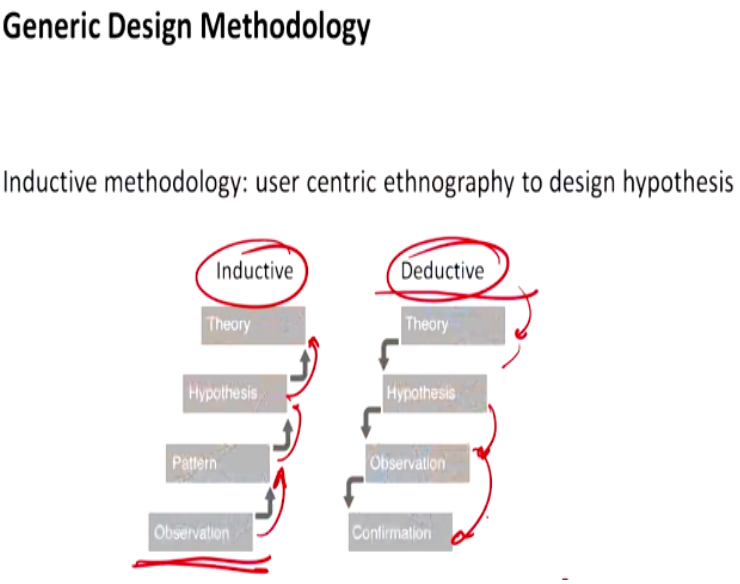

There is another design, approach of design. One is inductive design approach, another is deductive design approach. Inductive and deductive is also research approach taken in, this approach is taken in different other domains. This is not a particular process within the design field. It is generic to any other field. It can be in other economics and various other domains. So inductive methodology, the observation or the user's survey comes first in case of user experience design or user interface design.

And in other cases the observation, the phenomena what is happening in the natural setup comes first. And then we see the pattern, what is the pattern the simile between this observation of different cases of observation what is the similarity the patterns, similar patterns are happening there. From this pattern, whether this patterns are happening in different cases. So the designers and researchers give their hypothesis. So why this patterns are happening?

Why people are behaving in this particular manner when we give this kind of product or this setup of design. Then the hypothesis formulates and then the theory comes. So if you think about the Gutenberg's principle we will talk about the Gutenberg's principle. Gutenberg is the inventor of the printing press. So he invented a theory, of Gutenberg's theory based on the reading pattern.

So he observed the reading pattern of people and who are reading from left to right and from top to bottom and how do they read and where do they focus on the reading material and he started observing the people's reading pattern and then he first he observed and then he tried to find out the pattern, what is the hidden pattern between people's observation, what news they are reading. And then he gave a hypothesis and finally he gave the Gutenberg's theory.

And how people look at in different things and where the focal point lies. So we will discuss about this theory in later cases, later classes. The other opposite theory is the deductive theory, deductive research technique. So in deductive research technique what happens is first the theory comes and so designers create a hypothesis of the theory based on his observation and his knowledge and the hypothesis will be fixed, the theory will be fixed.

And from there a hypothesis will come and then we will see if this is the hypothesis and particular situation if I fit that what will be the observation and then the confirmation okay whether the theory works in this case or not. So that is a process of deductive research.

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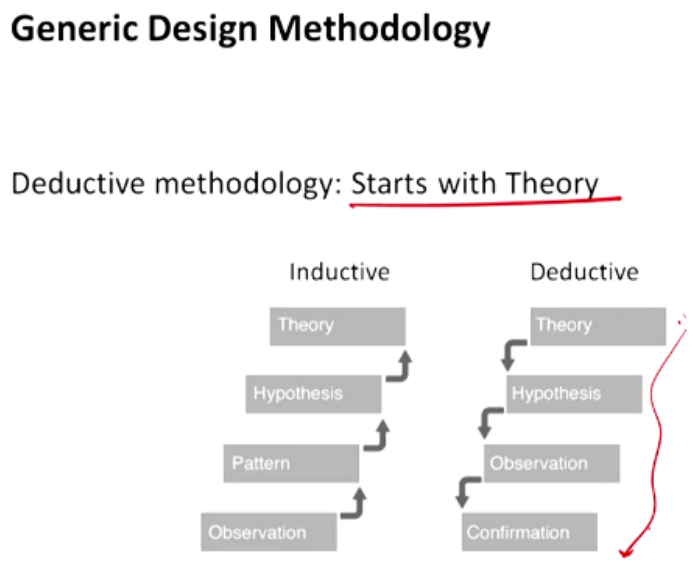

So the deductive methodology starts with the theory and then percolates to the confirmation of the observation.

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So in deductive theory we think about when the theory is already there then it will be a deductive technique. So for example if you think about a skeuomorphism of iOS platform so there is already set pattern of design language by iOS platform, the apple and also there is some style

guideline for android platform. So if we want to design in iOS platform, irrespective of whatever we do there are some guidelines which has to be followed.

And the look and feel of the design will be like this. It would not change based on a particular preference. So if I do not like this beveled edge, I like sharp edge, iOS will not change it. So I might go for a material design of google. I might like this flat style of design but still if I am using a iOS brand, iOS design style will be something like this and they will have this textures and colors and of real material. They will mimic that.

That is the meaning of the skeuomorphism. Skeuomorph means when the material and textures of the real material is getting mimicked in the virtual intangible interface. So you can see this drop shadow and the buttons look like button. This is the visual set by the particular company apple.

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Now inductive research will be when this company goes beyond their set design style and does something for the users particular requirement. For example if you look this interesting example, KFC is Kentucky Fried Chicken. So they started with chicken but they wanted to percolate into the target the Indian target audience where mostly many of the users are vegetarian. So they wanted to cater to some cluster of users which initially their brand does not go with.

So they changed their brand identity rather than red they went for green to show that this goes with the users requirement and there also the taglines are different. They are focusing on the Veg and the KFC tagline is the size is diminished and there is a range of product for Indian target audience. And when we also look at the responsive web design, responsive web design also targets different digital platform.

So it can be for desktop or laptop, small mobile phone or large tablet. These are the hand holding devices. These are the stationary devices and based on that the same design, same information how this can be changed based on the behavioral requirement of this. So this responsive web design is a need created by the user's behavioral pattern. So when we hold the mobile phone, our behavioral pattern changes.

So many of the websites like Facebook and many of the applications like whatsapp and other things they change when we open them in different devices. The proportion of the button and the way the informations, the size of the text, everything changes based on the user's requirement. So this requirement of responsive web design is generated by the process of understanding people's behavior. So this is inductive process of thinking.

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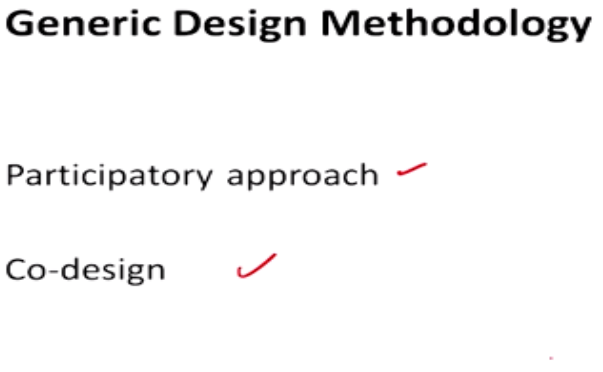

So the participatory approach, co-design these are the techniques where inductive design approach inculcates.

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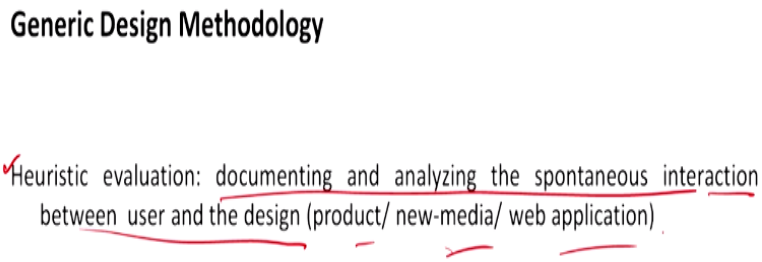

This is similar to the iterative model but this also happens in the inductive research. So heuristic evaluation which is documenting and analyzing the spontaneous interaction between users and the designers. It can be in product, it can be new media, it can be in web design. So this is a characteristics of the inductive design research where the research or the design starts from the observing people or observing the phenomena and in product design new media is mostly within the visual communication and web application UI UX. Everywhere it can this process can happen.

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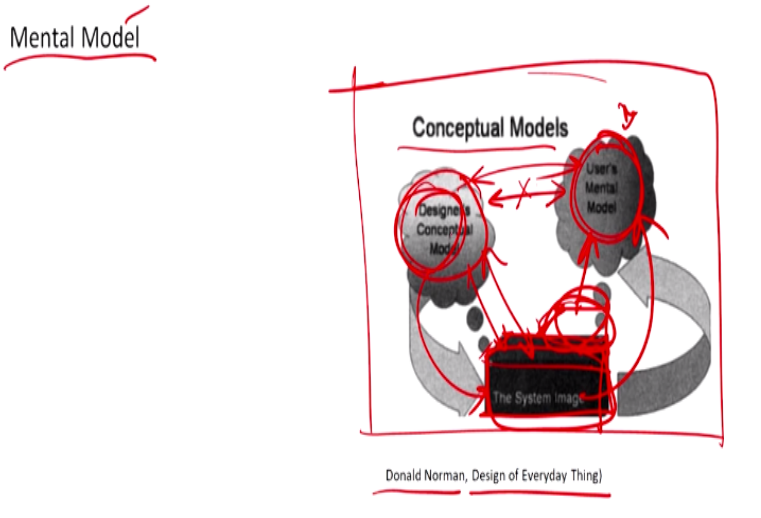

Then another interesting theory is the mental model. We need to understand user's mental model to give them the right solution. So Donald Norman, one of the famous design theoretician writes in his book, Design of Everyday Thing, gives this user's conceptual, the conceptual design models proposal. So through this diagram he says the conceptual design model will be successful when the designer's conceptual model will blend with the system image.

The system image is the mental model. This is the same. The system image is when we think about a product or a design what finally, what we see around us. And user also has a mental model. System image is finally what we see. So if we see a mobile, the final mobile, so that is considered as the system image. Mental model is, based on the system image what user creates within their head. So mental model is this one which is there in user's mind.

System image is what exactly the real life situation of the systems within the system what we see. And designers what designers perceive. Designers perceive when they conceptualize the design. Now here this everything is connected. Designers should understand what people are thinking when they are thinking about a particular image, particular product. If we take an example of a chair, what users are thinking when they hear this word chair.

They might think a four-legged some seating devices and designer should understand that whether that users are thinking about that. Now after understanding that designer should also look at what existing chairs are around our world. Now designer might defy that mental model of users. So they might say okay it might not be the four-legged seating device. It might be something like a hammock. That will become the designers chair.

And it might not confront to the system image or it might be. So a designer might create a very conventional chair. So it totally depends on how whether people your client requires that or client wants something else. Here this user testing and survey understanding the client is very important. And here the case studies what are the existing things the survey of that, the review of the work already has been done. That becomes very important.

So this is and they also influence each other. So when the designers create something different which is not in the system, for example this hammock like chair, so that adds something new into the system. So the system image changes. If the system image is now this they change, some deviation happens in that and the hammock also comes within the system.

So when first apple started to create this Macintosh, started to create this sleek design of desktops that was not within the system; so they created that and then people liked it. People accepted that and then it went inside the system image and the total system image changed. Now after this invention when that comes and people see those their mental model also changes because their perception changes.

And few people might like this new system which has been changed. That might come into their mental model and few people might also stick to the old style, style of design. They might think that no the old design was better and that will influence their mental model. And designers will always has to understand what their client is thinking about, what is there, predominantly they are within their mind or the mental model of this user. So let us take an example and it also changes over the time.

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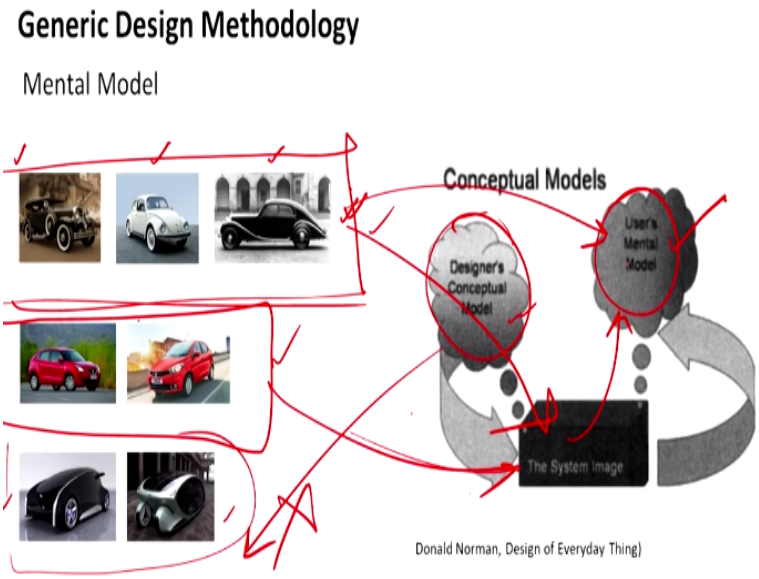

So let us see the previous first cars like this and this is the modernist car, Volkswagen Beetles which is still there because of some people liked it and this is some of the other cars which is

there in the old earlier stages and just after the industry revolution. So this might be the system image of the car when we were like in 1920s the modernist era. And based on this system image that times users mental model will be something different.

Now we are in this era where we see Maruti, Tata and other Hondas car which looks something like that. So the system image has this plus this. This was already there, now this and the mental model will definitely change. Now when designers think about futuristic car they has to, so these are some examples of Toyotas futuristic car and some other company's futuristic car. So designers conceptual model might defy all this existing styles which was there in the previous era which is already there around us.

And futuristic car will not look like this. So they will design something else to make that car look like futuristic and this will not be there in the user's mental model. So something when designers are asked to create a futuristic car, the mental model of the users has to be defied and a designer should not go about what users think. Then it will not look like a futuristic car.

And when they want to design something like today's car then they will exactly they should generally in general concept they will try to follow what users are thinking, what they are visualizing as a car. And if in certain cases they might, the designers might want to create some car which looks like the traditional old style of car. Few of the car even does that like Rolls-Royce Phantom and few cars are still there.

They has the aura of this traditional industrial during the modernist industry revolution that styles are still there. So that also is not exactly the user mental model. So if you think about Rolls-Royce Ghost or Phantom they have a particular design features which is old-fashioned but still it looks is also relevant in today's time. So a designer has to understand the mental model and the system image and then the play they should play with the how much proportion they will take from there and within the conceptual model of the final design.

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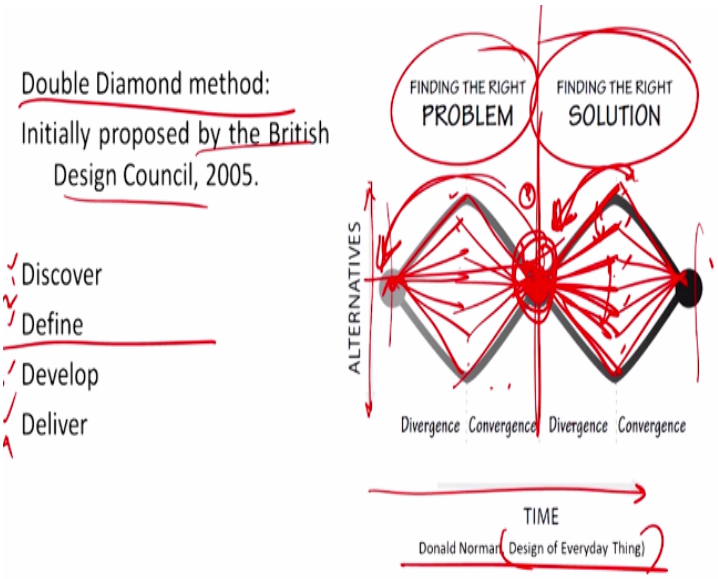

And Donald Norman also gives a design method how in terms of the solution a design should go. So this is called a double diamond method initially proposed by British Design Council in 2005. Donald Norman writes this in this book. It is Design of Everyday Thing. So this diagram is taken from there. So these are the 4 steps of this double diamond method and the initial 2 stages are for identifying the problem. And the next 2 stages are finding the right solution.

So it starts, this diamonds is created based on this axis. This is plotted as alternative. How many alternative options do we have and this axis we have the time, starting of the design and the end of the design. So half of this, what he says half of this timeframe will be the finding the right problem. If you find the right problem, half of the solution will be finding the right solution will be based on that and the half of your task is done.

And then the next phase will be the finding the right solution. So when we observe something based on user research we start to create multiple options and causes of what exactly the problem users have. So we observe a phenomena or through the ethnographic survey. So this is happening, this is the observation and what can be the probable cause of this observation. What is the exact problem.

There can be multiple numbers of problem A, B, C, D you can list down and then designers can narrow down to the one single problem they want to target or the amalgamation of very few

problems, the key problem what users need. So users need generation will be here. So here designers will fix with the users need. So what exactly they require, what they want and how do they want so that will be the solution. How can that requirement be achieved.

There can be multiple options of how this can be achieved. So these can be different solutions and this is the multiple variations of solution to target this particular problem. So problem is identified here. These multiple solutions are targeting this particular problem. So this is observation. From there a particular problem is identified. And these are multiple solutions to target this particular problem, one single problem.

And based on that multiple solutions there will be user testing. So users which solutions will work best in this particular context, the particular set of user and there will be one single particular problem and it can be your iteration. It might not be like this and final the solution will be amalgamation and the combination of 2, 3 options which were created over here, multiple options of solutions.

And the final options can also it can be selected from 1 or it can be combination of different and it can be also combination and iteration deletion addition and the final solution will be as the final product. So this is the double diamond method of identifying the problem and giving the right solution to the people. And which actually talks about the user research and how users behavior will be considered within the design. So in the next class we will start discussing about the details of each and every stages of design and we will continue that.