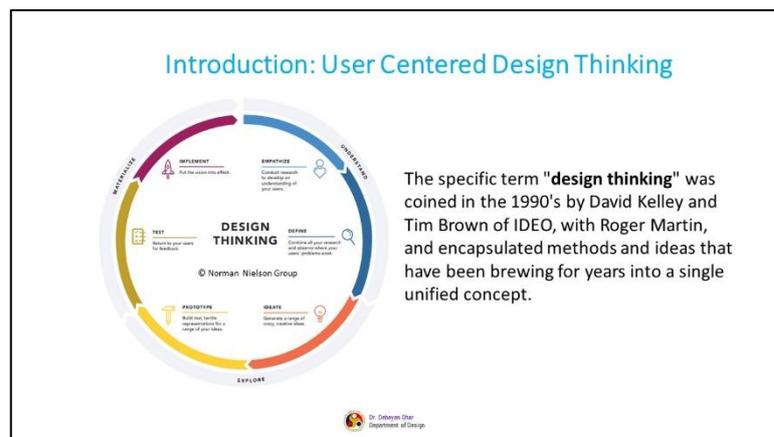


Usability Engineering
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Module - 04
Lecture - 10
Requirement Analysis - I

Welcome to module 4, lecture number 10. In this module, we will discuss about various tools and techniques that are used during the requirement analysis phase. This is the first part; the subsequent modules would cover various other tools which would be defined as requirement analysis 2 and 3. We will start discussing in this module about the design thinking process in detail and then start about discussing the tools and techniques that are used by designers.

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In the last module, while ending the lecture I did refer to this Norman Nielsen's design thinking process. We discussed a lot about various salient points in user centered design approach; do's and do not's, different types of users their characteristics how to deal with them and the important markers for the design team.

In this module, we will discuss extensively about the design thinking approach the steps that are involved in this process and how each of the steps can be materialized with the use of tools and techniques for ensuring that the objectives are met. So, what you see in this slide the left hand side of the image is the design thinking process.

Now, you can see this process has specifically primarily three major phases the understand phase, the explore phase and the materialist phase. Each phase has two sub phases associated to it, the understand phase has empathize and define phase associated to it while the explore phase has ideate and prototype phase associated with it.

And the materialized phase has the test and the implement sub phases associated to it. The specific term design thinking that we are referring to was coined in the year 1990s by David Kelley and Tim Brown of IDEO with Roger Martin. This is the same process that we have referred to in the last model; the Tim Kelley representations of the design thinking approach and these encapsulated methods and ideas that have been brewing for years into a single unified concept.

So, we would be referring to these phases in detail. Now, the design thinking ideology advocates hands on user-centric approach to problem solving and this leads innovation which further leads to differentiation and a competitive advantage. This user centric approach comprises of 6 distinct phases which are Empathize, Define, Ideate, Prototype, Test and Implement.

I would like to draw your attention here while discussing the user-centered design thinking process. We talked about how these leads to innovation which further leads to differentiation and competitive advantage. Now, this is important for us to understand that innovation is the tool through which we ensure that our product stands out from the in the market. And in order to innovate, we must ensure that we follow a process through which we apprise ourselves with the specific requirements of our users, we understand what is happening to them.

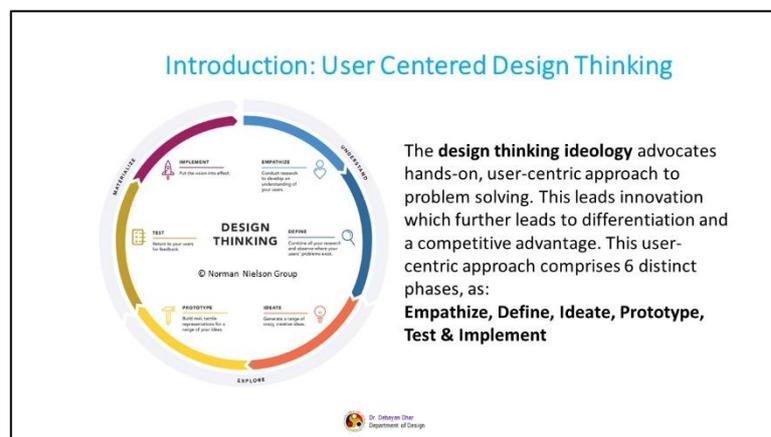
We also understand, what are the kind of products features that are provided to them from the market and how those are shaping their experiences. Understanding this in detail would allow us to define the degree of newness in the product or in the concepts that we are interested to envisage for our representative users.

Now, this ensures that we design a product, we conceptualize a product that stands out from the market that stand out from our competitors and that is what has being referred to as differentiation. Competitive advantage refers to the fact that when your product enters is launched into the market it has to have competition that already exists in the market.

And therefore, if your concept, your product does not have unique characteristics, unique features that the competitors does not have your product stands losing out the competition, that is what we are referring to as competitive advantage. Competitive advantage refers to the unique characteristics, to the unique features, to the unique concepts that your product has that makes it unique and novel when it is being exposed into the market and it starts its life cycle and competes with the competitors.

So, design thinking approach design thinking process ensures that by innovating it helps you in having a differentiation and a competitive advantage from the perspective of the competitors. So, in this process in this design thinking process we are going to study and discuss about the 6 phases that are represented in the design thinking cycle and these are empathize, define, ideate, prototype, test and implement.

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Now, the process of design thinking framework follows an overall flow of understand, explore, and materialize. These are the three main phases that houses all the 6 stages of the design thinking process; within these larger buckets fall the 6 phases that we have referred to as empathize, define, ideate, prototype, test and implement.

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Empathize

What is empathy ?

The term “empathy” is used to describe a wide range of experiences. Emotion researchers generally define empathy as the ability to sense other people’s emotions, coupled with the ability to imagine what someone else might be thinking or feeling.

Contemporary researchers often differentiate between two types of empathy: Affective empathy and Cognitive empathy. Studies suggest that people with autism spectrum disorders have a hard time empathizing.



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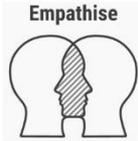
Let us first start about discussing this the phase empathize. Now, to better understand this phase empathize we must first understand what is meant by empathy. Now, the term empathy is used to describe a wide range of experiences. Emotion researchers generally define empathy as the ability to sense other people’s emotions coupled with the ability to imagine what someone else might be thinking or feeling.

Contemporary researchers often differentiate between two types of empathy: affective empathy and cognitive empathy. Literatures highlight that people with autism spectrum disorders have a hard time empathizing. What we understand by the word empathy is the ability to sense other people’s emotions and it is also coupled with the ability to imagine what someone else might be thinking or feeling this is the unique situation or idea that is being referred to when we use the word empathy.

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Empathize

- Affective empathy: Refers to the sensations and feelings we get in response to others’ emotions; this can include mirroring what that person is feeling, or just feeling stressed when we detect another’s fear or anxiety.
- Cognitive empathy: Sometimes called “perspective taking,” refers to our ability to identify and understand other people’s emotions.



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Now, the two different types of empathy states that have been referred to in literatures are the affective empathy and cognitive empathy. Affective empathy refers to the sensations and feelings that we get in response to the others emotions. This include mirroring what that person is feeling or just feeling stressed when we detect another's fear or anxiety. Here you can focus on the word mirroring it means when we are talking about emotions we are talking about observable emotions; emotions that can be observed.

Now, whenever we observe somebody at a particular state and the person is experiencing we can observe his emotions probably through his gestures through verbal and non verbal communication gestures. Now, what happens? We can understand those emotions, we can understand their sensations and feelings because we have we generally mirror the affects that they are experiencing while we are observing those persons and that is what we refer to as affective empathy.

While cognitive empathy, it is often termed as perspective taking and it refers to our ability to identify and understand other people's emotions. Now, the difference here lies the fact that the affective empathy refers to the situation when we observe a particular emotions into someone else and we experience the same emotions; we mirror the same emotions.

The same state starts affecting inside us and we start feeling the same sensations and experience the same kind of emotional states while cognitive empathy is more about understanding the perspective. We are trying to understand the perspective of a particular state which the other person is experiencing.

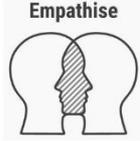
So, it refers to our ability to understand and identify the first stage is identifying what other person is experiencing or his or her emotions and then understand what they are experiencing. So, that is the different difference between affective and cognitive empathy.

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Empathize

What does this mean for Designers?
Conduct research in order to develop knowledge about what your users do, say, think, and feel.

Your goal is to observe actual users. Directly observe what they do, how they think, and what they want, asking yourself things like 'what motivates or discourages users?' or 'where do they experience frustration?' The goal is to gather enough observations that you can truly begin to empathize with your users and their perspectives.



Empathise

Dr. Debprasad Das
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Now, empathy seems to have deep roots in our brains and bodies. It also have a deep root in our evolutionary history. Elementary forms of empathy have been observed in our primate relatives in dogs and also even in rats. Empathy has been associated with two different pathways; in the brain and scientists have speculated that some aspects of empathy can be traced to mirror neurons.

If you remember the discussion we had in the last slide you would understand what this mirror neurons do or what their activities are. So, mirror neurons are cells in the brain that fire when we observe someone else perform an action in much the same way that they would fire if we performed that action ourselves.

So, these cells in the brain starts firing when we observe someone else perform an action in the same way that they would fire if we have performed those actions ourselves now this is the example that I have been referring to in the last discussion on effective empathy. So, the moment we observe somebody experiencing an emotional state, we experiencing somebody crying somebody laughing some other states of experiences we start mirroring the same experientiality state.

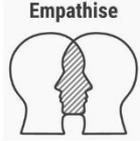
And how does it happen? It is all can all these states can be attributed to the mirror neurons and what they do these cells in the brain they start firing, in the same way that we see somebody else experiencing a state that those mirror neurons starts firing in that person by observing that person the same cells start firing inside us also and we start experiencing those affective states that is what we refer to as affective empathy.

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Empathize

What does this mean for Designers?
Conduct research in order to develop knowledge about what your users do, say, think, and feel.

Your goal is to observe actual users. Directly observe what they do, how they think, and what they want, asking yourself things like 'what motivates or discourages users?' or 'where do they experience frustration?' The goal is to gather enough observations that you can truly begin to empathize with your users and their perspectives.



Empathise

Dr. Ashraf Ali
Department of Design

So, what does this mean for designers? This means that we must conduct research in order to develop knowledge about what our users do say, think and feel because our goal is to empathize, is to experience, is to feel, is to understand the state that our users are in that is what we mean by empathize.

Your goal is to observe actual users; directly observe what they do, how they think and what they want you can ask yourself things like what motivates or discourages your users or where do they experience frustration and these questions are of prime importance to us where do they experience frustration.

So, the goal is to gather enough observations that can truly begin to empathize with your users and their perspectives. Please draw your attention here; the goal is to gather enough observation; that means, we are looking for a pattern, we are not looking for isolated cases. While conducting user study, we are interested to see at the situation at a occurrence of events that agrees, that exists over a range of our users a dominant pattern that is what we are referring to the goal is to gather enough observations.

These are the fundamental questions that we as investigators are concerned in the empathize phase. We want to know the frustrations of our users we want to know what are the motivations of our users, we want to understand what pains them because it is these states that would tell us what kind of intervention we would come up for them. More so, it is these states that would tell us our opportunity areas. The areas where we think there can be an intervention to address the situations.

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Define

- Combine all your research and observe where your users' problems exist. In pinpointing your users' needs, begin to highlight opportunities for innovation.
- During the Define stage, you put together the information you have created and gathered during the Empathise stage. This is where you will analyse your observations and synthesise them in order to define the core problems that you and your team have identified up to this point. You should seek to define the problem as a problem statement in a human-centred manner.



Dr. Ashwini Shear
Department of Design

Now, after the empathize phase the next phase is the Define phase. In the define phase, we combine all our research and observe where the user's problem exist. It is about pinpointing your users needs begin to highlight opportunities for innovation pinpointing your users need and converting them into opportunity areas for innovation.

What we are referring to here is that identifying the need and then converting it into opportunity areas for the design team that is what we are referring to why it is important because we are supposed to come up with a product with a concept that would address this need. And therefore, we must understand how do we define this need in a way that it becomes opportunity areas for us that is what we are referring to.

Now, during this defined stage you put together information you have created and gathered during the empathize stage this is where you will analyze your observations and synthesize them in order to define the core problems that you and your team have identified to this point.

You should seek to define the problem as a problem statement in a human centered manner and the human centeredness comes from the perspective that you define the need based on the scenario. Remember the discussions we had earlier about defining the scenario and this is where we focus on identifying the problem statement which is all about identifying the opportunity area in a human centered manner.

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Define

- In the define phase, use the data gathered in the empathize phase to obtain insights. Organize all your observations and draw parallels across your users' current experiences. Is there a common pain point across many different users? Identify unmet user needs.
- The Define stage will help the designers in your team gather great ideas to establish features, functions, and any other elements that will allow them to solve the problems or, at the very least, allow users to resolve issues themselves with the minimum of difficulty. In the Define stage you will start to progress to the third stage, Ideate, by asking questions which can help you look for ideas for solutions



Dr. Ashwini Shear
Department of Design

In the define phase we use the data gathered in the empathize phase to obtain insights. Organize all your observations and draw parallels across your user's current experiences. Is there a common pain point across many different users? Identify unmet user needs. This is a significant statement that needs understanding. Is there a common pain point across many different users?

Understand the situation that while you would be conducting your user study, ideally you would go to as many people as possible and these are your representative users say you have conducted a user study phase and you have contacted about 50 representative users, you have done detailed investigation with the scenarios; you have identified the scenarios the context of use.

You have identified various factors that influences their tasks, the kind of issues they face, their pain points their frustrations. Now, wait for a second and think are you going to focus on individual issues? What is the objective here? If you realize you would understand that the objective here is to identify issues that are dominating these 50 people among these 50 people. It might happen that around 20, 30 people would highlight an issue that are similar in nature.

There might be a divergence of opinion also in the identification of issues also, but remember we are designing for a market driven economy we are designing for, we are designing for an unmet need and for us, for our product to succeed in the market we must need people who would adopt to our product.

And for this to happen for our organization to succeed in successfully getting return on investment on the product developed or the concept that you have developed as a product you must have a sufficient market base, a user base who would adopt your product. And it is therefore, important that you identify a common pain point, pain point that is common across different users.

So, out of that 50 people if you see that there is an issue which have been reported by at least say 30, 40 people. I am just giving away tentative figures, but as you walk with your users as you learn with your users during your user study phase, you realize that there is an issue that is persistent across many people, across many of your users.

There may be some of the users who might not have faced those issue that is ok, but majority of them almost more than 60, 70 percent of them of your users that you have studied have highlighted similar issues that is the area, that is where you should focus on. And that is what we are referring to as the common pain point across different user characteristics.

So, the defined stage will help the designers in your team gather great ideas to establish what to establish features functions and any other elements that will allow them to solve the problems or at least allow users to resolve issues themselves with the minimum level of difficulty in the defined stage you will start to progress to the third stage which is the ideates stage and by asking questions which can help you look for ideas for coming up with solutions.

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Ideate

There are hundreds of Ideation techniques such as Brainstorm, Brainwrite, Worst Possible Idea, and SCAMPER. Brainstorm and Worst Possible Idea sessions are typically used to stimulate free thinking and to expand the problem space. It is important to get as many ideas or problem solutions as possible at the beginning of the Ideation phase. You should pick some other Ideation techniques by the end of the Ideation phase to help you investigate and test your ideas so that you can find the best way to either solve a problem or provide the elements required to circumvent it.

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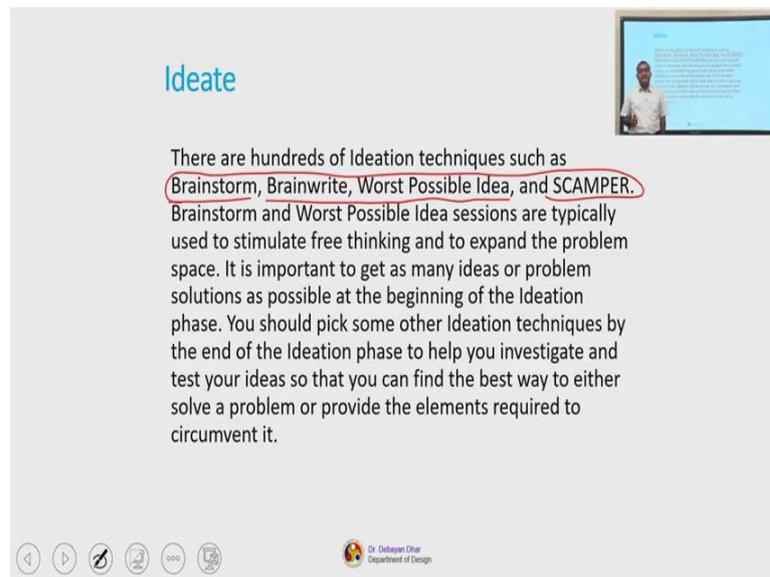
The third stage and the very crucial stage for coming up with concept models for addressing the unmet needs is the ideate phase. Ideation means brainstorming a range of crazy, creative ideas that address the unmet user needs identified in the define phase. So, from empathize we have extracted and defined our requirements our problem statement and this phase is now guiding; in what way our ideation should be envisaged or in what direction the ideation should start, should we think about unique product features?

We should we think about how information has been presented or how it can be presented in a new way? In what direction? We will discuss about the direction for innovation in later modules, but at this stage it is important that the define phase the outcome of the define phase which is defining the problem statement or the opportunity area would let you reach the ideation phase and ensure that you come up with ideas, specifically to address those requirements.

Give yourself and your team total freedom, no idea is too farfetched and quantity supersedes quality. At this stage it is important that we come up as many possible ideas that we can think of. This is the stage where we will not think of the entire details of the ideas, we will not think about the quality of the ideas, but we will start randomly generating ideas this is where quantity is important, how many ideas we can come up with. During this phase of the design thinking process, designers are ready to start generating ideas. Now, after we understand the users and their needs from the empathize stage and we have analyzed and synthesized observations in the design, in the defined stage.

We ended up with a human centered problem and now we start to think outside the box and we start thinking outside the box to identify new solutions to the problem statement that have been created at the defined stage.

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Ideate

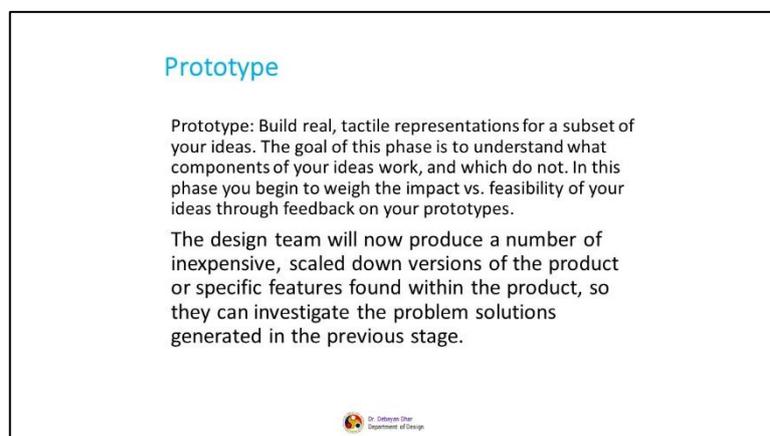
There are hundreds of Ideation techniques such as Brainstorm, Brainwrite, Worst Possible Idea, and SCAMPER. Brainstorm and Worst Possible Idea sessions are typically used to stimulate free thinking and to expand the problem space. It is important to get as many ideas or problem solutions as possible at the beginning of the Ideation phase. You should pick some other Ideation techniques by the end of the Ideation phase to help you investigate and test your ideas so that you can find the best way to either solve a problem or provide the elements required to circumvent it.

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There are hundreds of ideation techniques; some of them are Brainstorm, Brain write, Worst Possible Idea and Scamper. We will discuss this in detail in subsequent lectures. Brainstorm and worst possible idea sessions are typically used to stimulate free thinking and to expand the problem space. It is important to get as many ideas or problem solutions as possible at the beginning of the ideation phase.

Remember quantity is what is important for us and not quality you should pick some other ideation techniques by the end of the ideation phase to help you investigate and test your ideas so that you can find the best way to either solve a problem or provide the elements required to circumvent it. After ideate comes the prototype phase.

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Prototype

Prototype: Build real, tactile representations for a subset of your ideas. The goal of this phase is to understand what components of your ideas work, and which do not. In this phase you begin to weigh the impact vs. feasibility of your ideas through feedback on your prototypes.

The design team will now produce a number of inexpensive, scaled down versions of the product or specific features found within the product, so they can investigate the problem solutions generated in the previous stage.

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The prototype phase is all about building real tactile representations for a subset of your ideas. And the goal of this phase is to understand what components of your ideas work and which do not in this phase you begin to weigh the impact versus feasibility. These are the primary concerns, impact and feasibility of your ideas through feedback on your prototypes.

Now, what happens if you start thinking about feasibility about the impact in during the ideate phase you will not be able to come up with large amount of ideas you will be stuck focused on an issue and that would ensure that your ideation gets stuck you will not be able to think about more ideas. And therefore, it is important that you do not consider or you should not focus more on the impact of your ideas and the feasibility of the ideas in the ideation phase you consider about the impact and feasibility of the ideas during the prototyping phase. And, why you should consider this?.

Because in order to weigh the whether impact and feasibility which characteristics should employ in a particular concept you can only do that if you get feedback from your prototypes. So, you prototype it get quick feedbacks in order to understand whether the concept that you have come up with will have an impact on the requirements that you have defined whether is it is feasible to come up with this kind of solution, it is the prototyping stage that will tell you these answers.

So, the design team will now produce a number of inexpensive scaled down versions of the product these are prototypes that are not similar to the final product that would be developed. These are just the first representations of the concept that have been generated and these are scale down versions of the product it might be related to specific features found within the product as well.

So, instead of the entire product specific features can be prototype. So, that the design team can investigate the problem solutions generated in the previous stage, in the perspective of what? The features of whether the concepts have an impact or are they feasible. So, we focus on prototyping in order to ensure these two important things.

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Prototype

Prototypes may be shared and tested within the team itself, or on a small group of people outside the design team.

This is an experimental phase, and the aim is to identify the best possible solution for each of the problems identified during the first three stages.

The solutions are implemented within the prototypes, and, one by one, they are investigated and either accepted, improved and re-examined, or rejected on the basis of the users' experiences.



Now, prototypes may be shared and tested within the team itself or a small group of people outside the design team. So, when we talk about the team we are essentially referring to the design team and when we are referring to outside the design team we are referring to our quick you know other stakeholders who might be involved in the study this is an experimental phase.

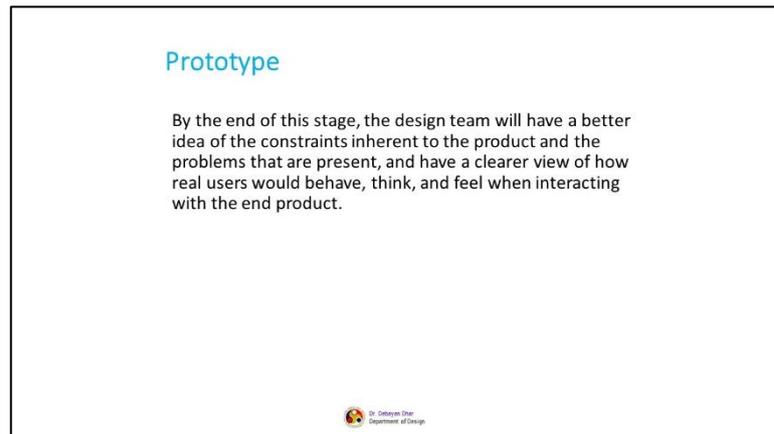
Remember. So, prototyping is always an experimental phase and the aim here is to identify the best possible solution for each of the problems identified during the first three stages. This is the aim of the prototyping stage. So, the aim is to identify the best possible solution, for each of the problems identified during the first three stages and what are the first three stages?

The first three stages are Empathize, Empathize, Define, Ideate these are the first three stages that we are referring to. So, whatever problems have been defined, have been identified by empathizing with our users and then analyzing the data doing a synthesis of the observational data and defining the problem statement and then coming up with different concepts is now experimented whether they are feasible or not; whether they will.

These concepts will have an impact on the need that has been identified, on the problem statement that has been defined and that is the main aim and objective of the prototyping stage. So, the solutions are implemented within the prototypes and one by one they are investigated and either accepted improved and reexamined or rejected on the basis of the users experiences.

So, insights from the design team matters a lot, their insights will matter a lot at this phase and it these insights ensures whether your concepts would be accepted or it would be rejected or some of the features are complex, whether they will have an impact or not, whether these are the features that are feasible or not; all these important discussions debates deliberations happened at the prototyping stage.

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So, by the end of this stage the design team will have a better idea of the constraints inherent to the product and the problems that are present and have a clearer view of how real users would behave think feel and when interacting with the end product. Understand the situation that in this phase of prototyping you quickly come up with the scale down version of your concept.

And you test it out initial testing is done by discussing it with your team members or close stakeholders and their insights with your debates and deliberations help you to define to understand whether a particular concept will have an impact on the unmet need or will it not have an impact. You will also understand whether these concepts can are feasible or not, can these be taken forward and developed into a full-fledged product.

All these things become clear at the stage of prototyping when you have an extensive experiment conducted by coming up with quick prototypes of your ideas and you are better informed and have a clearer view to understand whether the concepts that you have come up with will your real users be able to relate with your concepts.

How will they behave? How will they think? How will they feel while interacting with the product that you have conceived? So, prototyping phase explains, informs you about these issues of your concept in a vivid and greater detail.

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Test

Test: Return to your users for feedback. Ask yourself 'Does this solution meet users' needs?' and 'Has it improved how they feel, think, or do their tasks?'

Designers or evaluators rigorously test the complete product using the best solutions identified during the prototyping phase. This is an iterative process, the results generated during the testing phase are often used to *redefine* one or more problems and inform the *understanding* of the users, the conditions of use, how people think, behave, and feel, and to empathise. Even during this phase, alterations and refinements are made in order to rule out problem solutions and derive as deep an understanding of the product and its users as possible.



After the prototyping phase, we move on to the next phase that we call as the Testing phase. Now the testing phase is all about returning to your users; at this phase you return to your actual users for whom you have conceptualized the product and you return to them for feedback.

You ask yourself, does this solution meet users needs? Has it improved how they feel think or do their tasks? Designers or evaluators rigorously test the complete product using the best solutions identified during the prototyping phase. This is an iterative process and the results generated during this testing phase are often used to redefine one or more problems and inform the understanding of the users.

So, that is the objective of your testing phase. Why do we go for testing? In order to ensure that we redefine one or more problems and inform the understanding of the users with the view from the users after conducting the test with our end users, we are in a position to see whether the way we have conceptualized the product whether the conceptual model of our product relates with the mental model of our users. Is there a match? Is the gulf of execution smaller?

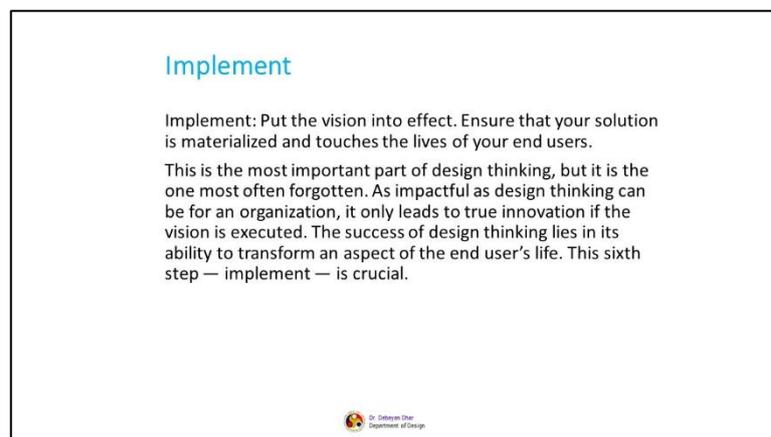
If you remember our previous lectures, we discussed about gulf of execution. We discussed, how much extent the user has to adopt in order to learn the conceptual model of the product this is the phase that we understand about that. We understand whether the

concepts that have been presented as prototypes and now are being tested, does it meet the requirements of the user? Does it satisfies them?.

Does it make them more worry some? Does it make them more concerned or does it more make them frustrated? That is what we are more concerned about. We are we want to know the conditions of use how people think, behave, feel while interacting with the products.

Even during this phase alterations and refinements are made. So, do not consider that this is the final phase, everything is complete everything is done no this even at this phase alterations and refinements are made in order to rule out problem solutions and derive as deep an understanding of the product its users as possible.

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And after the test phase we come to the state or phase of implementation. This is all about putting the vision of the product into effect. Now, we are ready to we have all the data we know that the concepts that we have developed we have tested them out, we have redefined them, we have corrected the issues, we now are confident that the product will work the features will work and would be able to meet the user's requirements.

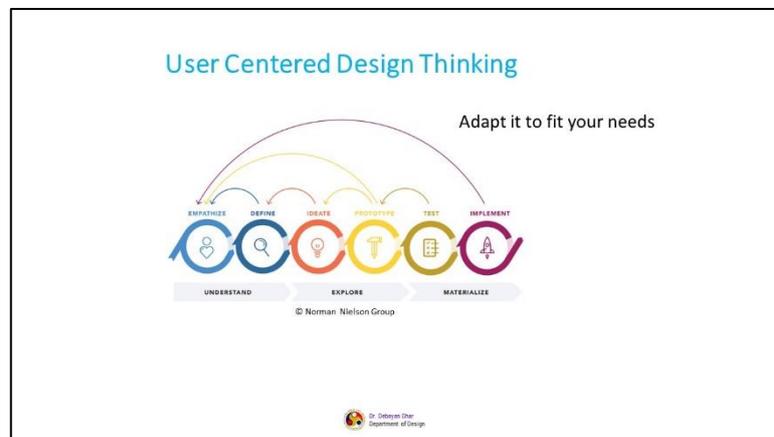
So, ensure that your solution is materialized developed. It is a complete fully functional product and touches the lives of your end users. This is the most important part of design thinking, but it is one of the most forgotten also as impactful as design thinking can be for an organization.

It only leads to true innovation if the vision is executed well enough the success of design thinking lies in its ability to transform an aspect of the end user's life that is what we are

trying to achieve, that is what we are trying to do. We are trying to use our creative potential. We are trying to address the unmet needs of our users through our creative potential we empathize with them in order to ensure that we can design for them and we want to design for them to ensure that the gulf of execution; that means, the conceptual model of the product matches with the mental model of the user.

So, the success of design thinking lies in its ability to transform an aspect of the end users life and this is the 6th step the final step of the design thinking process, implement the most crucial one.

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Now, coming back to the circular process that we have been discussing please remember that this circular design thinking process that we have discussed earlier is not linear. It can be adapted to fit your requirements; requirements of the design team, requirements of the designers it is like this it is a linear process.

But considering that the way it is being represented here it might look as a linear process, but essentially it is highly iterative in nature you can see here in this picture that each stage can be related to the previous stages. This ensures timely addressable of issues and redefining of statements according to the requirements of the user.

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User Centered Design Thinking

The Design thinking approach is not a prescribed step-by-step recipe for success. Instead, use it as scaffolding to support you when and where you need it.

Each phase is meant to be iterative and cyclical as opposed to a strictly linear process.



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So, the design thinking approach is not at all a step by step or a linear recipe for success. Instead we use it as scaffolding to support you the designer when and where you need it each phase is meant to be iterative and cyclical as opposed to a directly linear process. You can see here, after empathizing this phase while you move down to the defined stage if you feel that your observations are not helping you out in defining the problem statement you can again come back to this stage.

Similarly, if you face any issue here, if you feel the problem statement does not accurately provide you with an information, where in which direction you should think for creative ideas you can again come back to this defined stage, you can again come back to the defined state and again can go back to the empathize state.

Likewise, every step has a relation to the other stages you know and that is why it is called at a is as iterative. This ensures that time and resources are saved while designing a product. If you remember to the discussion that we had when we discussed about waterfall model.

We discussed about why waterfall model does not addresses the requirements of software development, what are the challenges, what are the issues with that kind of models if followed. The user centered design thinking process addresses those challenges by being iterative in nature.

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User Centered Design Thinking

It is common to return to empathize and define, after an initial prototype is built and tested. This is because it is not until wireframes are prototyped and your ideas come to life that you are able to get a true representation of your design.

You can also repeat phases. It's often necessary to do an exercise within a phase multiple times in order to arrive at the outcome needed to move forward.



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So, it is common to return to empathize and define after an initial prototype is built and tested that is the beauty of the user-centered design thinking approach and this is because it is not until wireframes are prototyped and your ideas come to life that you are able to get a true representation of your design that is the reason why we go for the iterative approach because we will lose a lot of time and resources if we do not use the iterative approach.

You can repeat all these phases the way you want it wherever you feel that information is not sufficient enough for you to move to the next phase or to provide you clarity. So, that you can perform those, initiate those phases ethically it is often necessary to do an exercise within a phase multiple times in order to arrive at the outcome needed to move forward. This is the importance and the benefit of following the user centered design thinking approach.

We will now discuss about the tools and techniques for each of the phases empathize, define, ideate, prototype, test and implement and would see how each of these tools and techniques help us in designing a product that is usable that gives highest satisfaction to our users.