

## **Human Computer Interaction (In English)**

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### **Interaction:Lecture 3 Part 1**

Hello, everyone. Welcome back to the class of Human Computer Interaction. Let's get started. So this week, we will be studying interaction. So let's see. This is the outline of what we have covered in the previous lecture.

We have discussed what is design. With the help of different real world examples, we have studied what to design. We have also discussed interaction design. And with the help of inclusivity, accessibility and design principles, we discussed the different use cases. We had also had a panel discussion on design principles.

And we had a hands on experience with Canva. So I hope you are well versed with the same now. This is the outline for this week. We will get started with design thinking, then we'll go for design process and interaction design process. And this week, we'll also be having a tutorial on interaction design process and one hands-on experience with Figma.

So let's get started with design thinking. What is design thinking? It is a user-centered iterative process for problem solving. It focuses on empathy, creativity, and experimentation. We'll be going for that in more details in the upcoming slides. In short, design thinking aims to put designers, developers into the shoes of users who are going to use the system.

Design thinking aims to understand and share feelings, needs of the users and try to build a design which is intuitive in nature, inclusive and easy to use. Why design thinking? Because it encourages innovation and creative solutions. With some case studies, we are going to consider how design thinking has turned a small company into a billion-dollar company. It prioritizes understanding and solving the right problem. That's why Tim Brown has said design thinking is a human-centered approach to innovation that draws from the designer's toolkit to integrate the need of people.

So that is primarily emphasizing the empathy. The possibility of technology and the requirement for business success. That's what I was talking about in the use case. So design thinking framework primarily has six key stages. That is something you can see

here.

The first stage is called empathize. It aims to understand the users and their needs, because unless you don't understand the need of the user, we can't design a system or build a system which will be useful or usable. The next stage is define the problem, which requires clearly articulating the problem with clear specification, documenting them so that the developer can further build the system over it, ideate the solution. So brainstorming is one of the potential solution to do that because once you define the problem, the next stage is what all the possible solutions are there. And for that brainstorming is one of the group activity where Different people participate and they try to come up with a possible solution.

Doesn't matter good or bad, but the idea is with the group activity, something useful will come out. Prototype, the next stage where basically it try to build a tangible solution. That is something we can interact with. That is something we can try. It's kind of toy example of the actual system we are willing to build.

Test. It basically evaluate solution with the users, because before launching the product or the solution in the market, we have to validate it. So testing is basically help us in evaluating the solution that we have built, whether does it fulfill the requirement of the user have or not. Last implementation, so which try to put the vision into the effect. because people may have different idea. But is it possible to convert that idea? Is it realistic? And that is only possible after implemented.

And without it, it is of no use. And the most important part is mentioned here, iterative nature. Many of the stages which are mentioned here often overlap and repeat. because in the earlier lecture, I have also emphasized that you can't build a perfect solution in one go that requires iterations, that requires modification, because even you can't understand any of them in first go for a given problem. You can't understand all the requirement of a user in one go, because often, Users also generate or probably discover new requirement based on the system you are building, based on the discussion we are having with them.

Similarly, the problem statement get more refined when we go over it. Based on that, we further discuss the different idea, using brainstorming and other techniques to come up with a solution. Again, you can't come up with the best prototype in one go. Again, the idea built over on the previous solutions that you have. And again, every time if any changes are happening, you need to evaluate it, you need to validate.

Does the required changes that you have made with the intention of improving the system Is it really improving? That is something we have to validate. And again, you

have to implement it further. And that's where you can see here in Empathize, there is a user. We conduct research to develop an understanding of your users. In Define Stage, we combine all your users and observe your users' problems exist.

And of course, as part of the definition, users may have probably thousands of problems, but it is not possible and probably not worth to solve all thousands of the problems. In that case, you have to prioritize them. So that could also be one part of it. Ideation is basically generate a range of crazy and creative ideas. so crazy mentioned because sometimes it doesn't matter whether it's possible or not let's discuss it we'll try to come up with a solution probably maybe putting some constraint if the idea worth exploring and in the prototype as we discussed it is primarily building some real tactile representation for range of your ideas and for testing return to your user for feedback Sometimes it is not possible to reach your real user all the time.

In that case, even experts can probably test your system at least for the initial evaluation and get back to you if there are any changes that are required. And finally, putting the vision into the effect, that's where basically the implementation part is there. And if we further see that basically the empathize and define are more understanding problem, and prototype and ideation is primarily the exploration problem. And finally, the test and implementation is more materialized. That's why the quote by Edward Tufte, good design is like clear thinking made visuals.

I do agree with him. This is the use case I was talking about, Airbnb. Airbnb is one of the big company, billion dollar company now, but was it always the case? No, it was not like that. In 2008, it was very small company , but design thinking made this company turn into the billion dollar company in just few years by making changes to their system, website, UI, based on the design thinking procedure they have followed. So as you can see in 2008, it was look like something like this. Next year by 2009, they were improved.

I would say that, and the further 2010, you can see that, I mean, that has further changes based on the discussion they have done with their users, their stakeholders, because there are primarily two stakeholders. One is the host who is going to, host the travellers and the second is traveller who is going to stay at the host house so airbnb came up with a unique idea turning house into the hotel many times you have spare rooms many times you are not at home itself it is sitting idle can we make some earning from it and that will also basically the give an experience of living at home even in the foreign land with all the amenities like kitchen and probably anything that you have at home. So that's where basically the Airbnb was built with this idea, this unique idea, I would say that. And now in 2024, you can see that how does it look like. Now the UI is very clean with very clear description.

with buttons for most common thing often you want to compare the solutions that you have on the map with based on the other constant like how far they are based on the point of interest that you have and many other details that you can see here and also the ratings by the different hosts who have stayed this place so far and their numbers And this use case is basically, as you can see that, the market capitalization of Airbnb is now \$85 billion. At the time, it was nearly \$100 billion as well. And the development of the Airbnb platform used design thinking to empathize with the users and redesign the website, leading to a huge increase in the customer engagement and the bookings. Looking at this idea, Y Combinator one of the I would say that investor firm which usually invest in startups so I also encourage you to apply to Y Combinator if you have any idea novel idea that you think you can solve in your real life Y Combinator is there to help you and in fact there are many such opportunity there are many such VC fund are there to help you with this so your idea worth exploration who knows you will be the next airbnb who knows you'll be the next billion dollar company if any one of you the audience is succeed to make this i i will be very happy and i feel this course worth more than anything anyways let's get back to the example Y Combinator invested in Airbnb in early 2009 and the company valuation market was relatively modest. Airbnb was valued at nearly just \$2.

4 million at the time of YC invested it and YC had just given \$20,000 as a seed funding for the stake of 6% in the company and given the market valuation of 84-85 billion dollars at this moment can you guess this six percent stake is now nearly five billion dollars that is given a kind of return of nearly 2.5 lakhs times just in the time of 15 years so again Any idea worth exploration and most of the interesting ideas come from your real life. Just look around, who knows interesting idea is awaiting for you to solve. Apply the design thinking that we are learning here to empathize the user, learn their requirement, learn their requirement, define the problem, again, come up with the idea, what could be the possible solutions, come up with the prototypes, come with basically some validation through evaluation, and finally implement it. So I strongly emphasize and encourage you all to basically pursue your idea if you have any.

So let's come back to the stage one, empathize. So the purpose of empathize is gain a deep understanding of the user's need. and how would you get to know the user's need? There are several ways and there are several methods. One way could be user interviews, observation, empathy map, and surveys. We'll discuss this in the upcoming lectures in more details.

But to briefly tell using interviews, have you may have some structured questions you may ask the users what kind of problem they are facing again the questions that we have

asked in the earlier lectures what is bad design what the problem that you're struggling how to come up with the optimal solution and all you can try to ask all those questions and you'll be able to come up with a very good questions and that will help you in learning the requirements of the users Spend time with the real users, shadow them and observe their behavior in the natural environment. The point it is highlighting is the natural environment because you can discuss n number of ideas in just sitting on tea. But unless you don't discuss the problems with the real user in the real situation, you can't come up with the exact problem they are facing. So that's why it's very, very important to come up with the natural environment. Let's take an example of running app we are talking about.

So you can't come up with the problems without going into the ground. You can't discuss the idea in your living room and just come up with the best solution. You'll have to get your shoes dirty. You have to go on the ground. You have to discuss with the different stakeholders.

And the purpose of this is to discover user motivations, behaviors, pain points, and desire. What are their expectations? Another example is by Procter & Gamble. It's one of the big company, you know, is use empathy to redesign their line of Swiffer product by observing people's cleaning their homes, leading to innovation cleaning solutions. Again, this idea come from the real life, real world and that's where basically I again highly recommend you all to read the book by Durong Norman.

Let's go to the next step. So, stage two talk about defining the problem. So, you need to basically synthesize finding from the empathize stage to make it more structured Formulation of what kind of expectation the user have what kind of problem you want to solve? So steps involve identifying key insight and patterns from the user research That all we have discussed through the survey through the interview and many other ways create a problem statement a clear and concise definition of the problem there should not be any ambiguity and Because if you have ambiguity in the problem statement, take my words, you're not able to solve the problem efficiently, and that will unnecessarily lead the gap in your system between the user and the developer. And you can ask the question is how might we, and that is one of the standard, in short, it's called HMV, HMW, a format to encourage creative solutions. So, It emphasized the quote by Yuri Levinin, the founder of the Waze. Waze is one of the popular company in US that give the real-time condition of the traffic to the users.

It is based on the crowdsource and that is something again, can we do something similar in India? And so on. I mean, that is something you can think about. So he said, fall in love with the problem, not the solution. So the key is problem.

Understanding the problem is very important. Defining the problem is very, very important. And documenting it is even greater things to do. Because once you translate your idea into writing, you get more clarity. You get more doubts in your mind what to add, what all the constraints you need to put in and so on. So example is when Nike was designing the Nike Plus app, they defined the problem around the motivation of exercise, focusing on social and personal engagement.

So next stage is ideation. So let's ideate it. And the purpose is generate a wide range of ideas and the corresponding potential solutions. And the methods for this is brainstorming, mind mapping, scamper, sketching, storyboarding, and so on. Again, we'll discuss about them in greater details in the upcoming lectures. part of the brainstorming one thing is very important you should encourage no idea is bad because once you stop restricting no you how can you say this how can you say that people stop giving their ideas because some ideas may be crazy may not be feasible but based on the further brainstorming and the discussion you may come up with a solution which nobody has thought of before and that's where the collective group activity is basically very very useful so the the idea is to foster the creativity they are also basically use techniques like crazy 8s which basically encourage or allows participant to come up with the eight ideas for its case there's so so they also use so they also use techniques like crazy 8s where participants sketch eight different ideas in just eight minutes time so so this idea is this thing is very fast very quick in just eight minutes you came up with the eight ideas and again just discuss the feasibility discuss the basically the importance discuss the solution and you are good to go so ideo Shopping cart projects. So basically a team brainstorm hundreds of ideas and leading to a innovative concept like safer more convenient and more user-friendly Shopping carts.

That is something you can see and that is the shopping cart designed by IDEO So next stage is prototype so the again the purpose is create tangible and testable version of the ideas that is something you can interact with that is something you can play with and then different types of prototypes based on the their fidelity so fidelity is more like how close the system that you are building close to the real product that you are expecting so low fidelity is just simple sketches wireframes mock-ups Mid-fidelity, more structured, grayscale, and probably interactive. High-fidelity, it's a detailed and interactive prototypes. So mid-fidelity is somewhere in between high-fidelity and the low-fidelity prototypes. There are several tools. Many of them we are already having a hands-on experience in our course, including Figma, Adobe Express, Adobe XD, sketches, cardboard, paper, and many others.

The goal of prototyping is primarily to build prototypes to explore solutions and get the

feedback. Example is Apple creates multiple prototype of their devices such as iPhone to test everything from screen size to button placement to anything that you see in the final product that you see and that's where basically they again do the feasibility do the evaluation, validation, and based on that, I mean, it is quicker and probably cheaper for the, even the faster for them to converge on the final idea or final solution that they are going to provide. So the next stage is test. So where the purpose is to validate and refine prototype with real user. Because many a times when you ask the user, I have this solution in mind, do you think this will work? They may say yes, but they will come up with the real problems once they start playing with the system that you build for them.

And probably building a final product and getting the validation is, I think it's too late. It's better to involve the user early and probably get their feedback so that they can play with the system and accordingly you can incorporate their feedback and make any changes to the system. So there are methods such as usability testing, A-B testing, user feedback sessions, and collect qualitative and quantitative data to do the validation. So you can also use tools like heat maps and user recording to see where users travel. So like in this case, you can see probably this is the website you might have built, interactive website.

And when you're building this, you are expecting the user to probably pay more attention to this part, this part, or probably this part. But based on the user interaction, you see that probably these things are fine, but this particular place is not getting as expected probably Attention as it's supposed to so it means you need to do something there. Maybe the buttons colors are Not quite visible maybe Probably the appropriate message is not there. Probably the name of the button is not there as expected So n number of things you can think of such situation And the final stage is implementation. So the purpose is to ensure that your solution is materialized and and touches the lives of your end users.

And the final and the critical step in design thinking that often gets overlooked. There are many design thinking framework that you'll be having where probably they just talk about the previous five stages and they don't talk about implementation, but it's good to consider this. So as Donald Norman emphasizes, we need more design doing. Design thinking is not just about ideation, it requires action because you may have n number of crazy ideas, but that is not possible at all.

So we require something in action. So implementation is where creativity is tested and idea becomes reality. So true innovation is only achieved when solution is successfully executed, transforming the end user's experience. So the quote by Milton Glasser, there is no such thing as a creative type. Creativity is a verb, a very time consuming word. It's about taking an idea into your head and transforming them into something real.

So I do agree with it. So one thing I said in design thinking, iteration is one of the key thing because you can't come up with your final solution in just one go and often you need to go forth and back to probably refine the things. Be it prototype, be it idea, be it like defining the problem itself or be it like understanding or getting more clarity on the user requirement. So iteration in design thinking is one of the core activity, that is something we have to do. So as we discussed earlier as well, in understanding task, we have empathize and defining.

In exploration part, we have idea and prototype. And finally, in materialized part, we have test and implementation. And these arrows are basically indicating that iteration can happen from one stage to another. So From this, I believe it's clear it's not a linear process. Stages can be revisited as needed.

Testing may reveal a need to redefine the problem. Continuous improvement through the user feedback is required. And keep refining the design until the user needs are fully met. One example for this you can think of is Netflix regularly iterates its recommendation algorithm and interface based on user feedback and testing to improve user engagement. Because if you don't refine it, every time probably you'll get the same recommendation or probably something which user has not liked.

You are not taking that feedback into the consideration. You are still giving probably old recommendation which user doesn't like and that will end up the product uses. So progressively and proactively, you have to incorporate these changes in your system. So benefit of design thinking, it encourages innovation, it reduces risk, user centered, and it foster collaboration. Because in encouraging innovation, you can see that it promote different creative solutions. not just one, but many, and you can again choose the best one out of it.

It reduces the risk because testing ideas before the full-scale development is going to save a lot of your time, a lot of your money, and so on. And also the feasibility, whether the user is going to like or not. And keeping the user and the audience in the center is basically keeping the core concept of user-centered computing. because you are going to build a system for users. And there are different ways through which basically there is diverse perspective to holistic solution.

And you can read this quote again, which I have also discussed earlier. If you think good design is expensive, you should look at the cost of bad design. So let's do a kind of another discuss. So let's discuss another case study, design thinking at work.

So the Stanford d.schools approach to re-imagining a patient experience. So we have interviews with the patient's parents and the hospital staff. defining it the problem was framed as a reducing anxiety for children during the hospital visits ideate so you can brainstorm the ideas and from interactive walls to story based navigation what all the possible solutions and finally you can build a prototype for kid friendly waiting rooms so where probably one possible solution could be probably putting the stickers some toys, probably some super heroes and heroines, poster, and so on. Gather feedback from the patient, parents, and health care professionals. So what's the prototype you build? Let them give the feedback. What do they think about it? And finally, the outcome, a more engaging and less stressful environment for the young patients.

Another use case you can think about For the project we started in this course, you remember the project by Aditya and Manya? Project Wave. How we can help visually impaired students in learning braille efficiently and effectively. So the case study here is our approach to reimagining a visually impaired person's experience. The problem is improving brain learning experience for visually impaired person. So what you can empathize? You can empathize, explore challenges with traditional learning for visually impaired student and instructor.

You can define the problem. Identify need for more engaging and accessible braille learning tool. Again, probably you can use the advancement in the technology, wearables, IoT, anything that you can think of. Ideate. So create interactive solution with the tactile feedback, haptic feedback, progress tracking, language support, and many others. And then probably build a mid fidelity or even you can start with low fidelity mid fidelity and high fidelity prototype to assess the functionality and the usability of the solution you can validate the system by collecting the feedback from the users and all the stakeholders to refine the prototype and finally the outcome a user-friendly braille learning tool that boost engagement and simplifies teaching So can you do the same for another task? So I leave this to you to complete this task where you have to come up with an approach for re-imagining the passenger's experience for a cab booking.

So you can consider a use case of booking a cab through any popular apps that you have. Ola, Uber, Rapido, Blue Cab, or any others. So what are the challenges in the design thinking? Getting the stakeholders buy in and aligning on the goals. It's very tough task. Also getting access to all kinds of stakeholders is again a very, very difficult task.

Balancing creativity with the practical constraint because you can come up with ideas which are probably out of the box. but is it practical may not be so that is something you have to balance you have to do some trade-off to come up with the optimal solution managing iterative cycles with the tight deadlines because you have very less time to

probably complete these stages and you also have to reiterate many times and ensuring the diverse representation for inclusive solutions so that's what i mentioned in the beginning as well So the example is Henneken use design thinking to revamp their bottle design involving not only designers, but also the stakeholder from marketing, production, and even the consumers. A challenging but rewarding collaboration. So design thinking encourage collaboration to come up with the optimal solution. And this collaboration basically help us in understanding the feeling, the needs and user perspective from the design thinking point of view.

And so that you can come up with a design and the solution which is innovative, intuitive and efficient for users. So the conclusion of design thinking is summary of the key points is design thinking is flexible, user centered approach. It keeps user in the center. Empathy, creativity and iteration are central to the process.

Effective for addressing complex and ambiguous problems. Takeaways, start with the user in mind. So the importance of design process is it guides designer from understanding a problem to implementing a solution. It encourages creativity, structure, and iteration.

So the key stages involve research. ideation, prototype, testing and implementation. So this is one of the well-known and quite popular design process called double diamond design process. It has been developed by UK Design Council and this is the visual representation of the design process and it divided into primarily into two phases. So the first phase is called discover and define. And the second phase is called develop and deliver.

And there basically you can see that in the discover and define. So there is divergence and there is convergence. Similarly here, In the phase 2, there is divergence and there is convergence. So, these divergence is more like, because this first part is for discover, you need to have insight into the problem. So, you may come up with so many insights. there is probably not restriction just think about how you can define the problem what are the ways you can get the insight of the problem and so on so based on so many insight and the things you can now refine it because you can't again as i said earlier as well maybe there are thousands of the problems they have but probably you need to focus on some specific So that is something you can do in the next stage where you define the area to focus upon.

So that is convergence. So given kind of divergence, there are so many insights, so many problems, and then you converge it to probably a few and define them well. So that is called discover and define. So in short, this is also called problem space.

You are basically defining the problem. The second stage is called deliverance. develop and deliver so where basically again you can come up with so many potential solutions but is it possible that all work they some maybe probably potential solution which is very costly do you want to follow that probably you need to find a some trade-off there are some potential solutions that you are thinking but it may not be feasible to implement it So that's where basically there's a lot of this stage, this divergence stage, as you can see that. So you first, without much constraint, you try to think about all possible solutions, all potential solutions. And in the convergent phase, basically you can try to finalize which one to choose, which one to finally go ahead with. So the goal is balance divergent, that is called exploring, and convergent, that is focusing. So that is about double diamond design process and you can choose any of the real world problem to apply this design thinking, design, double design process to come up with the solutions and you can define what is the discover and define problem space and what is develop and deliver that is the solution space for a given problem.

So let's discuss these two phases in more details. So the purpose of discover and define is to research and understand the problem. So basically learn everything about your problem, everything. And in the converge, you narrow down to just one problem because as I said, you can't solve all the problems. So basically the purpose is research and understand the problem and the activities involved how you get to know that basically user interviews, market analysis, competitor research and the surveys and the outcome would be probably rather gather user insight and identify key challenges. And in the define phase, so basically the purpose is narrow down the focus to a clear and concise problem statement.

As I said earlier as well, if you don't come up with a clear and concise problem statement, you can't solve the problem at all. There will be ambiguity. You may probably end up solving something else which user even was not expecting and it may be a surprise. So we should not have such elements in our solution.

So there is Affinity mapping problem framing creating user persona. So these are the ways you Define it and the outcome will be well defined problem or design brief So this is how it looked like you can see that so you have user research Market research brainstorming contextual inquiry. So using these methods you come up with learning everything about the problem and then using the techniques of synthesis of the research, user persona, problem definition, point of view and problem framing, you can narrow down to probably just one problem or a few that you can solve. So the next phase is develop and deliver. So the purpose is generate ideas and explore solutions. So there are several activities through which you can do so brainstorming, sketching, prototyping, and

usability testing.

And finally, the outcome will be a range of possible solutions. So that is considered every potential solution as part of the developed phase, that is the divergence phase. And as part of the deliver phase, which is focusing on converging the perfect solutions. You refine, test, and finalize the solution, and there are activities such as high-fidelity prototype, user testing, and final adjustment that can be done to the system. And the outcome will be a polished, user-approved product ready for launch. And this is how it looks like. You have the rapid sketching, so many sketches, low-fidelity wireframe, some paper prototypes and again using this consider all possible solutions and finally you deliver and converge to the perfect solutions for this.

So there are frameworks in interaction design, five dimension of interaction design you can see that, 1D to 5D, 1D simply words, 2D visual representation that is images and icons, 3D physical objects and the spaces that you have, 4D animation transition that include time and 5D that is behavior how user interact. And the usability heuristic by the Jacob Nielsen, visibility of the system status match between your system and the real world, because only such system can successful, which try to mimic the user behavior in real world to the digital transformation that you're doing in the digital world. So user control and the freedom. So if you consider these in mind, so in the interaction design, you may able to come up with the best solutions. So, what is the similarities between the Double Diamond design process and Interaction Design Framework? Both involve iterative process that encourage feedback and refinement.

Both emphasis on user-centered design and aim to solve real-world problem by understanding the user needs. A slight difference is more Double Diamond is a more high-level design process as compared to Interaction Design Framework forces more on specific details of the user interaction and usability. So some real world examples for the design process, Spotify design. So it applied basically the double diamond for user process, defining the music streaming problem and develop unique discovery features.

It used interaction design principles for seamless playlist creation and intuitive navigation. Airbnb, the use case that we discussed, it applied design process and then design thinking to come up with the best solutions. So in this case, it has followed the double diamond to understand the host and the traveler needs. And it employed interaction design framework for booking interactions and clear communication between the host and guests.

So conclusion is design is not just about what it looks and feels like. Design is how it works. Steer jobs needs no introduction. So takeaway is a successful design process,

whether through double diamond or interaction design framework is about creating solutions that are not only visually appealing, but also functional and user centric. So let's come back to the difference we were talking about design thinking and design process. So design process is a structured sequence of steps followed to create a product or solutions, often including stages like research, ideation, prototyping, testing, and implementation.

It is a linear or iterative methodology aimed at achieving a specific design outcome. In contrast, design thinking is a mindset and problem-solving approach that emphasizes empathy, that is one of the key difference, creativity, and iteration. It is a user-centered strategy that involves understanding the user needs, defining the problems, ideating the solutions, prototyping, testing, and often encourage a nonlinear and a flexible path to innovation. So let's discuss this with an example of Airbnb use case because Airbnb is one of the most studied design thinking and design process problem as a use case where they study how a small company just very small few million dollar company turned into nearly 100 billion dollar company. So the focus of design thinking involves a user-centered mindset that begins with understanding the problem people face.

In Airbnb case, it's in early days, Airbnb struggled to gain traction. The founder applied design thinking by staying in their own listing. that is something you can see interesting by staying in their own listing just like Jack Ma through his company Alibaba try to basically buy the product from their website by himself. Emphasize with the user, understand the pain point. They discovered the poor quality photos of the rental space were a major issue.

Outcome, they redefined the problem by focusing on how better visuals could increase the booking. This led to an idea. They went door to door in New York City, photographing host homes themselves. This empathetic, iterative, and creative approach was a pivotal moment that helped A&B take off. And in case of design process, the focus is a structured step-by-step method to create a solution was the problem and the user needs are defined. So in case of Airbnb, after understanding the user needs and validating the initial idea, high quality photos, Airbnb moved to a more structured design process.

They researched their target market, designed the scalables system to support host build prototype of the platform gather feedback and iteratively improve features like booking payments host management in a systematic manner and the outcome is very clear unexpected the structured approach allowed airbnb to develop a reliable platform scaling into successful global marketplace so the key difference with example we can see here With the Airbnb example, design thinking drove Airbnb's initial problem discovery and moot innovative idea by emphasizing empathy and understanding the user's experience. And the design process enabled Airbnb to finally execute and systematically build the

platform step by step from the validated concept to a robust product. So in summary, design thinking is about discovering and redefining the problem creatively, while design process is about systematically developing and executing the solution. Thank you.