

Human Computer Interaction (In English)

Prof. Rajiv Ratn Shah

**Department of Computer Science and Engineering
Institute IIT Madras**

Prototyping for Human-Computer Interaction

Hello everybody, today we will be having a change of pace from our current code structure and we will be having a panel discussion with Hardee and Sanjana. Our topic for discussion today is Prototyping for Human-Computer Interaction. Now before we get into the hows and the whys of prototyping, let's understand the what. What is prototyping? Well, the basic need and the understanding is that a lot of times finished products including the backend and the entire functionality to make even a minor change take a lot of time and effort. However, design is something that needs to be changed according to the user's needs. That is why designs have a lot of numerations of changes that help make the design perfect.

And for that, we need prototyping, which is basically the study or the ability to keep on changing designs, just the visual look of the product to help make it much more interactive and user-friendly. We have, of course, as I mentioned, Sanjana and Hardee, and we will be going through a lot of questions with them. So, Sanjana, why do you think prototyping is an essential process or part of the design process? Thank you so much, Shlokh. So when it comes to human-centered products, prototyping plays a very crucial step.

In prototyping, we have multiple steps that take us to the final product. When we have a final product, it gets very hard to integrate every change with the backend as well as the frontend. So what prototyping does is it allows us to make small, small changes based on the user feedback. As Shlokh had mentioned earlier, user feedback plays a very crucial step when it comes to designing products for a target audience. So each user feedback allows us to make those small, small changes at different steps of our prototyping.

And then at the end, when we have a high prototype, high fidelity prototype, we can directly implement it into a proper product. So by now, of course, we have been introduced to all the three levels of design processes, low-fi, mid-fi and high-fi. My question is, how do these different levels of fidelity fit into the overall design process? okay so as he has mentioned there are three levels of prototyping there is low fidelity medium fidelity and high fidelity all of these fidelities act as a way towards going to our main product now low fidelity serves as the baseline this is where we try to come up with

the core functionalities of a product try to understand what is needed by the target audience and then we make a rough sketch by it now here we can use a simple normal paper pen drawing try to understand where our product where our icons need to be where our functionalities need to be what type of functionalities we need and then we have a medium fidelity now medium fidelity it gets a little better and a little more furnished compared to the low fidelity here what we have is we have a little more color palette we have we understand the color schemes that we would like to use in our product and then we try to understand what proper icons we need what proper functionalities we need based on the user feedback we had gotten from the low fidelity Again, from the medium fidelity, we take user feedback, try to understand what our final goal is. And based on that, try to make it clickable and visualize the entire product in a high fidelity. High fidelity, we basically visualize our product, how it's going to look finally.

And each step by step, we connect all these fidelities with user feedback. It's a continuous process. And based on this, we visualize how our entire product is going to be and then finally bring it to life when we properly integrate the front end and the back end. Another very common thing that I'm sure everyone has heard by now is that the whole point of the design processes and the entire structure of it is to help us collaborate better in bigger teams. So how much of that do you think is true? I feel like design really unites people when it comes to presenting something.

So if, for example, there are four or five people, we can expect some sense of creativity from everyone. It can be a little challenging when you have conflicting creativity, but it also pushes them to come as a united front and present a project with varied amount of creativity and also put in every idea and aspect into their product. For example, we have been talking about user feedback. Now I get user feedback as an important step, but also having a group of people working together on a project, we are already constantly getting some sort of feedback on each person's work. Now, for example, I'm in a team with Hardee and Shlok.

I would be doing some work and there would be feedback from them. And this constant feedback allows me to present my best work forward and same for them as well. So I feel working in a team brings out the best in every team member and presenting the best work possible. I hope that answers a lot of your questions. Another question was that an undeniable truth is that technology, especially software, has grown exponentially over the past two, three decades.

And however, design processes have existed since much before that. So how has the design process changed with the advent of modern tools? Okay, so now if we look back in the days where the technology wasn't as established as it is right now, people still went

through with their design processes. They would instead of using their laptops, they would sit and use paper and pens to visualize their ideas and code it out. But now with the advent of technology, we're seeing that now it's much easier to visualize a product much better rather than coding it out and checking how it's going to look finally. Like we have technologies like Canva, Figma, which allows us to visualize it much much better and allows us to get the proper and right amount of feedback that is required at every step of designing a product.

Well, speaking of tools, What would you recommend for someone? I'm shifting to Lo-Fi now. I will be talking, we'll focus on Lo-Fi as a topic right now. And I wanted to know what kind of tools and technology do you use for Lo-Fi considering that Lo-Fi is a very rough idea of the technology that you're trying to make or design? Okay, first I would like to say you can always use the traditional method that is take a pen, take a pencil, start jotting your ideas down, draw it out. Much easy. But also if you want to go on the technical side, there's always apps like Miro, Canva, Figma.

They're all free of cost, open source. You can use it whenever you need. It is very easy. It's very user friendly. You can definitely use these applications for your user lo-fi fidelity.

And I guess a very important question that is asked a lot and even I felt personally is because the lo-fi is still a rough model, what warrants something to be present in the lo-fi sketch of ours? What part of the app should we make sure exists in the lo-fi? Because it is a rough figure which is crucial but it doesn't need all the features, right? So what is the balance? Okay, so when it comes to lo-fi again, it allows us to jot down what are crucial functionalities are going to be for the application. For example, if I'm making an application for a student portal, so I would know for at the lo-fi fidelity point, I would know what all features I want to add in my application. That can be the dashboard, the assignment, deadlines, all of these, these are the core functionalities I would make sure that are present in the lo-fidelity. Now, when coming to low fidelity, I get it, it's a very rough figure, but again, now when you're presenting this low fidelity for a user feedback, you get a better understanding if you're missing out on the core functionalities yet or not. Because when we come to medium fidelity and high fidelity, they go more towards the visualization rather than the fundamentals of your application.

When you're at the low fidelity, you get to know the fundamentals much better and what are the target audience needs. For example, if I'm making a student portal right now, I'm in my final year. There can be people who are not in the final year and working right now and they can't for a fact know all the needs of the application. So reaching out to students who are at the age of 15, 16, 17, college going students, you get a much better idea of if you're missing out on any core functionalities or not. So I really feel low fidelity starts

your base and then you can definitely layer up on it.

So, this is leading on from the previous question, Sanjana. You've talked about how lo-fi can include certain things. Now, I think a lot of people would have the same doubt, is what are the limitations of a lo-fi design? What can it not include or should not include? Okay, when it comes to lo-fi it does have its own set of disadvantages. It's basically again lo-fi it's a very rough figure. You can't really visualize this and the user feedback you get at this point about regarding the front end of the application or the visuals of the application.

the user feedback is not going to be helpful at all because it's a very rough figure definitely not something you will stick to also till the end it just gives you a base idea of what you want in an application but getting user feedback at this point it can be little misleading also at some point thinking people might think that this is how the final prototype will look at the end with the placement and everything but I feel like LOFI does not give us the very accurate visuals that one needs when it comes to the final product. And also LOFI is again a very rough figure. It also does not allow us to understand what wireframe is going to connect to what wireframe. We are itself not very solidified on which interface is going to link to which other interface, how the user flow of the application is going to go. low fidelity is just for the base it allows us to get a crucial understanding of all the major functionalities in the pillars of the application not more to that you cannot have a better understanding of the visuals or any other feature for that matter of fact and when do you think that it's appropriate for a lo-fi design to transition into the next phase of a mid-fi design okay so again You have created your lo-fi, you have drawn your figure out, you have noted down all your core functionalities.

Now it's the time for it to go under user feedback. Now once you go into user feedback, you collect the feedback of the user and then parallel it with your product and see what all features that you have missed out, what all features you have already added or something that's very redundant, something you can remove. Based on that, you can make a parallel, see what needs to be added, what does not need to be added. Keep in mind who your target audience is. Based on your target audience, you need to add your features, remove your features, manipulate your features and see what all features are required at the end of the day.

It shouldn't be very clustered. It shouldn't be too heavy for the person to understand. It should be very user friendly. So keeping all of this in fact, you refine your low-fidelity. After you refine your low fidelity, you put it under user feedback again.

See that if it meets the needs of the user. And based on that, after your user feedback is

complete, you have refined your low fidelity. That's when you transition into your medium fidelity, where you'll be dealing with your color palette, application placement, icon placement, functionality placements. And based on all these placements, you get a good understanding of where to put what. Yeah, I think your explanation of prototyping and lo-fi has cleared a lot of doubts.

And let's move on to the next phase. Let's move on to mid-fi prototyping. So the question I want to ask is, how does mid-fi prototyping improve upon low-fi prototyping in terms of what changes are expected to be made and what changes are supposed to be made? If you could give a bit more light on that. Yes, Shalok. So right now, as Sanjana had mentioned about the transitioning from low to medium, we had seen that we have to have our functionalities fixed when we are doing for a low fidelity like we should have in our mind that on this particular page or basically a home screen let's take a home screen we'll have these many icons these many apps like screens to be shown we'll have this functionality like for example if you're taking a mobile phone you'll have a home you'll have a button for like you know removing the ongoing apps So these kind of things, when we are like, you know, kind of fixed with, oh, here will be my navigation bar, that's when we move on to a medium fidelity.

Now, you know, after low, you have talked to your target audience, you've known what the issues are or what changes they want to bring in, what they want in our app. After all of that, One thing we have to keep in mind is that all this need to transfer into an app which should be seen seemingly to the audience. It shouldn't be an issue for the audience to identify what this icon does or where the navigation bar is, what this bar icon does. Like in the navigation bar, if you have a home icon, it should take you to the mail page. So something along these lines, the users need to understand.

So mid fi or the mid fidelity, it really helps in enhancing our low fidelity in a way that it brings out how our final product would look like. For example, the home screen button. Like that, those small, small details, if you keep in mind during mid-fi, it will help you know what functionalities you have added and where those functionalities are being added. So I feel like this transitioning from low to mid really helps the person to understand if their layouts, when they had sketched them out, if they're working properly or not, and if the user, their target audience, if they're able to understand where what functionality is and if the app for example the student portal as Sanjay had mentioned if it's a student portal a student of let's say 15 year old or a college going student both need to understand the functionality with or without knowing computers like what a function should do so I feel like mid-fi is where you start bringing in like start bringing that application into life The starting point. That's the mid-fidelity's importance.

So you clearly talk about these things, the transition as a transition from an unstructured to a semi or rather even a completely structured program or design rather. So this would of course require a lot of tools to be used. Yes. Are there any tools you would recommend to our viewers for this? Yeah, so when it comes to tools, what we or normally the designers really use is Figma, Canva, Miro. So when it comes to Canva and Miro, what you're initially doing in those applications is that whatever icon you have, any part of designing, if you have a wallpaper that you want to add in the front of the, like whenever you're opening an app, If you want a wallpaper, stays for some seconds, let it go, and then you move on to the app, like a transition, animation kind.

So that kind of wallpaper, the icon designs, sometimes the fonts you would like to change, make it bold, those kind of things you use Canva and Miro for. And to integrate all of this, mostly what they start using is a Figma. So in Figma, what you can do is, if it's an application or website, you have frames for it. So if it's a website, you'll have a triangular frame. If it's a mobile phone, you'll have a mobile phone frame.

You can take all of those and start like the layouts that you had made in your lo-fi. You can bring them into a structured way. So in your Figma, you can see all them going one by one. However, like for example, if I'm opening an app, First is the, there's a button, it takes you to the another page.

So that is how the frames work. So one frame to the other, they're connectable, like you're basically connecting your frames. So in this Figma, what it helps is all those designing part that you've made, the functionalities, it helps you to make it like, get it on in a paper in that frame. in order to see how your app will look based on just the design process. It won't be working for now.

It'll be just placement-wise. For example, if there's a navigation bar, if it's too thick, too thin, you can modify all of that. Or maybe you don't want in the first page, you want it in the second page. Or this functionality should have another page by itself. For example, we've seen sometimes we have chatbots in applications. So chatbot, people usually tend to have an icon at each and every frame.

While others in their apps, what they try to do is just have a help button in the last, which just takes you to the entire chatbot frame. So you have to see based on your application, what application is and who your target audience is to know where that chatbot icon or the entire frame should be. Should it be within the app continuously or later on? That all depends on the target audience. So Mid-fi is basically what we are trying to do over here using this tool is to bring our imagination or our creativity, what we had for the app and what we want the users to see in a better form in a way which is trying to like you know

bring towards the final product not exactly the final product but towards it like there's a one step ahead we have taken after low fidelity Okay, so you talk about Canva and Miro and of course Figma as tools we can use for midfire prototyping.

Yes. But these tools have a lot of customization ability, right? And midfi as a design is the middle step of a design process. It is not a complete design. Yes. So how do you find the right balance between a midfi design and the value it provides to you? What I mean by that is how much time should we really be spending on it and what details can we.

.. make sure to get and what it is can we afford to avoid when making a mid-fi design right So this firstly is a very good question. When we come to the high fidelity and we start making the app into life, which is the backend and the frontend, those parts you're not able to make those minor changes. Low fidelity, you're just trying to know where the positioning of the functionalities would be. You are not really engaging yourself with, oh, this will be the design or this would be my wallpaper or anything.

You're not looking at those aspects. When it comes to mid-fi, you are trying to visualize it more betterly. You're trying to make sure all that is fixed that was mentioned. So again, feedbacks play a very big role in it. whenever we're designing MitFi, when it comes to our functionalities, whatever we're trying to put into it. Those functionalities should reflect in a way that user is able to understand and we're able to get a flow of the app.

which after the Hi-Fi step and after the backend and frontend is done, you cannot make those minor changes. That, oh, maybe a person with some disability cannot change or cannot have this voice. We don't have this voice assistant, maybe. We can't do this change later on when it comes to Hi-Fi or after Hi-Fi when you're trying to build the entire app. So it is very crucial when it comes to mid-fi to know your target audience properly and have your functionalities up to down noted down and like it's all like, you know, you should know where to place what in order for their usability.

So I feel like user testing should be done immensely during these first two steps low-fi, mid-fi in order to make your hi-fi that better and sleek that you don't need to change anything in there. You can just, you know, change some design stuff that you have to, for example, like the background or, you know, maybe like make it visually appealing, aesthetic in the sense. So when it comes to Mid-fi, these functionalities are the major focus where to place them how to make them the thickness the thinness the color palette color palette is obviously very important when it comes to mid f i because after this you you can change your color palette but because you'll be putting all your functionalities in it'll be very hard in the final step to do that Because you know, for example, if it's a water conservation, obviously you will have colours which are related to water, which is blue,

green at max. You won't go beyond that. So whatever app that you're making, it needs to give the comfort and essence of your app with the color palette as well.

So I feel like those functionalities as well as when it comes to color palettes, some shapes you're adding, some visually appealing things that you're adding in it, it needs to be very consistent as well as visually appealing and the functionalities need to be very proper in order to convey to your audience that this is here without going and explaining it to them. Right. So another question that I had, what kind of feedback should we expect in a mid-fi? See, the understanding is that low-fi is a very rough sketch.

Yes. So it's very clear what you're expecting. You're expecting, does this fit the idea? And a high-fi would be like... Yes, is this the perfect design? But a midfire is somewhere in the middle.

You're talking about navigation bars and things like that. So when you're giving it out for user testing, when the user feedback comes back, what kind of feedback are you expecting to look at or want to look out for so that you can train your questions accordingly? Yes, that's a very nice question. So when it comes to user feedback, it's obviously, as I mentioned, we stress on functionalities the most during MitFi. So firstly, it'll be like, for example, there are, if this is an app which is used by, let's say, kids to the oldest people, right? They're using the app. You should have a place where you can make the font size smaller, medium, larger for people to see. So in this case, I think like those kind of feedbacks when it comes to the functionality, this is where our user feedbacks are most generally based on.

Like for example, adding this kind of functionality will help to serve all the age groups. or having something more visually appealing colors. You don't want to stay with like white black, or black background white, or black background, you know, something black black, white white, something like that. If something is camouflaging, not bringing, not shining your app out, you wouldn't want that kind of, Like, you know, design. And when people, when the designers are generally designing, what really happens is that you're seeing it all the time.

So you don't realize the smaller changes, the minute changes in the functionalities or anything. For example, I have a red background and by mistake I've written my font also in red. I haven't seen it much nicerly because I've been designing it. But if someone else is seeing it from the outside, they'll see my design as well as this functionality.

For example, the chatbot. Someone feels like, oh, because of the chatbot, the other functionality behind it is being covered. People won't be able to see it because we're not

able to move it. Move the chatbot along the screen. So these kind of functionalities, it is majorly based on the usability. It comes with if the users are comfortable, if they can understand, if they are able to do it without any assistance.

I think that's where we get to know that a medium fidelity has uh if we like basically get all those checklists done that's when we get to know our medium fidelity is like good to go okay uh so every time you give out your mid fi for user feedback you will always get feedback regarding the few changes you have to make yes right and you're talking about the core functionalities of what a midfire must have It's still a bit of a grey line of course. I want to know from your experience, what do you think is the right time to transition from a mid-fi to a high-fi prototype and start working on the finer details of your design prototype? Right. So the first place when we need to know is that our medium fidelity is done, is when all the user feedback that you've got, you have addressed them in your app, you've made sure you've thought them through, if there are any font size like I mentioned, if those kind of things like the icon size, font size, if those kind of things are integrated or maybe when you're designing it itself, you've kept it medium size. for everyone to look at it or the color palette is beautiful. You've got like user feedback does not always need to be a negative thing.

It could be a positives as well about your app. So if you get to know you have balanced out your negatives and your positives very well, everything is combined and you don't need to make any minute changes further. then I think that's when you can transition from medium to high. As we all know, high and the steps ahead of that, we cannot really change detailing when it comes to functionalities or maybe placement of the icons or whatever crucial functionalities that are there. So what you're trying to essentially say is that it's time to transition when only the finer details need a final touch rather than the actual core functionalities need a change.

Yes. Okay. Yeah, that's very nice. What do you think are the main advantages of HiFi prototyping? Okay, so let's deal with what high five first is. So in high fidelity, like now we talked about medium fidelity, right? So we have all our functionalities in their place. We have the color palette in their place. Now what are we going to do is when it comes to high, you're going to make those minute changes. For example, like in low fidelity, we thought of putting a picture over here.

Like, for example, cinema. Movie tickets, if you're trying to sell, if that's the app for it, we'll be showing the movies continuously. That this movie picture needs to be here, this needs to be here, for example. All of that, in MidFi and HiFi, what we're trying to do is we're trying to put those pictures in. So in the end, we're trying to see if the background and the movie picture, does it go very well with it or not? So those kind of minute

changes we're trying to bring in with the background, with the pictures.

with videos, for example, we'll be trying to put them in. And we'll see in the Figma if all of them are looking nicely and with the clickable wireframes that we use, if everything's having a perfect flow with it. So that is our major focus when it comes to HiFi. Now, with HiFi, what happens is we're trying to sell it to maybe the stakeholders. Because obviously, whenever we're doing business, we won't be giving the entire app ready-made.

We'll be talking to our stakeholders. We'll be being in touch with them if they're liking the design, if they think if it's a good idea for the app. And that's when those minute changes when it comes to, oh, they maybe want, because of their company is having a blue-green logo or something, they want.

.. that it should be written somewhere, that it's powered by this company. So make those integrated changes. I think HiFi really helps in understanding your stakeholders, your users even more better, and adding those minute changes that you need to. So this sounds like a very detail-oriented process, of course. Yes. What are some challenges, at least in your personal experience, developing HiFi prototypes that you faced while making them? What are some challenges you'd like to share? Yeah, so when I was doing the project under my course, human computer interaction, we were making about a student portal.

So in that student portal, we are trying to add like assignments into it, their daily tasks, their routine, like for example, what time class they have for today, what their schedule is, when do they have classes, when do they have tutorials, and everything used to have it in one app. So when it came to our high fidelity that time, the place we focused majorly was just to integrate everything properly. But for example, like people, like drop-down lists are there, right? So what did we do is we forgot to add like an arrow beside it. which shows that there's a drop-down list.

We knew mentally that when we click this, a list appears. But we forgot during the user's perception, there needs to be something which makes them feel like, oh, there's a drop-down list. Like, you know, those kind of things we forgot to add. So that adding one arrow for the drop-down was something which came to our minds at the very end.

But again, it's high fidelity. Those tiny changes you can keep adding. So that was one of our high fidelity issues. And when it came to even our color palette, we had chosen a very maroon, black, white color palette. But when we asked the users, because our images were very towards like blue-green, so we decided to go with a white background and a blue-green aesthetic so that it looks, you know, very consistent and people get familiar with the app. This is a question for the broader context of the importance of

design processes. But how does a HiFi prototype or how can a HiFi prototype rather be effectively used in stakeholder presentations to help them give a better idea of the product or the design of the product we have for them in mind? Yes.

So again, when it comes to MidFi and HiFi, we are designing that on Figma, right? Where we have clickable wireframes where we can, you know, get the flow of the app. Now, these tools that we're using, it really helps in understanding what functionality is doing what in the app. For example, if I click this button, help button, it'll take me to the help page. So some things like these functionalities, whenever we're presenting it to the stakeholders or the users that we target audience that we have, when we're doing the presentation, we'll be showing the entire flow of the app through Figma.

So that's when they'll get to know, okay, this is how the look and feel of the app will be. This is what the functionality next it would show, like this functionality does this, this functionality does this, or you've taken care of all the users that are there aging from, let's say, five year old to 12 year old or 18 year old, whatever. So they will see if those kind of conditions are met, if it's visually appealing, if the stakeholder wants to invest in it, wants to make it a full-fledged, their own application under their company, or maybe if there are UI, UX developers, they will give you some points into it. If this could be done in the front end or the back end. If this functionality could be added or not. If this background that we want like a tie dye thing can be added, will it look nice? Will it be like feasible? So all those kind of things we get to know through these presentations, the stakeholder get a very broad idea of what the app is, what we're trying to, you know, like if there's a problem statement, obviously that we'll have, what problem are we trying to solve through our app? and how it's going to go for all the users.

Are they able to go smoothly with it or there are some issues or if the stakeholders think that this is an app which might not sell because of its aesthetics or it might because it has a very nice aesthetics which is different from what the trend we're seeing in the business world right now. So I think those kind of changes and interactions with the stakeholders help us to know where our app stands in the industry. That was the final question of the session, of course.

Thank you, Hadi and Sajna, for your insights. And before we leave, I'd like to explicitly... give out the key takeaways from our panel discussion. The first one, and a very small short way to understand this, is what each level of prototyping holds value for. Lo-Fi can be primarily used to test the ideation part of the process. MidFi is used to test the usability of an application. So even though the focus is on the design aspect, it is on the design aspect of how you navigate across the application.

The third is the HiFi. The HiFi is the final validation before a design is pushed into production and used for presentations to rally the stakeholders to agree or to suggest changes for their design. Understanding why prototyping can streamline the overall design process and performance in terms of cost, human resources, time and money. Well, I'm sure as we discussed on the panel, the general idea is that design is something that needs or is required to change consistently to reach a final output. The first design can never be the final design. However, if it's in a production code, if it's a code that involves a certain apparatus of backend, it is very hard to even make small, small changes because then that messes up the flow of the entire website.

So therefore, design actually helps streamline the process even though it might seem like it's adding an extra step into the process. Now, A very good question to ask or a very good key takeaway that I understood from their discussion with them was that they always mention about the right user feedback. A lot of times, if the stakeholder isn't the one being asked the question, non-stakeholders might not understand the true requirements of the product. For example, if you are developing an app that is to be used by people who are not familiar with computer science or technology in general, and you make a product that has lots of drop down lists, not very easy navigation, the arrows are a bit misaligned. These things as a tech savvy person you would understand, but if that was meant for a person who is not as tech savvy, then your user feedback is almost rendered useless.

So, there is a very important point to keep in mind on who to ask your user feedback from. Always remember everyone involved in the process from the customer to the designer is a stakeholder who can be asked feedback. Everyone apart from that is not so helpful in making usable changes. Now, this question was asked by me during the panel and I had to re-emphasize on it. Where can we learn design and how can we learn these tools to make these prototypes? A major part of the design tools can be learned through YouTube of course very easily all online resources are available and the tools that we use majorly for example Figma, Miro, Adobe XD all of these are 90% free even though they have premium packages the ones that are free the free part of the course is enough to make an entire prototype we have all used them the free versions are amazing and don't worry about that now yeah so with that i like to sum up our entire discussion and uh thank you for joining us today thank you hardi and sanjana thank you