H HAVEN

Making interior design easy with collaboration!

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VALUE PROPOSITION:

Short: Your space, your way. Making interior design easy with collaboration

Long: Haven is an AR app that empowers digital natives to collaboratively design their spaces. It transforms fragmented inspiration and feedback into a seamless, shared process, making interior design accessible, social, and budget-conscious.

Problem/Solution Overview

Gen Z and digital natives want to create curated, personalized living spaces but often lack the tools, budget, or confidence for professional interior design. Furthermore, the process of sharing ideas and getting feedback from friends and roommates is fragmented across multiple apps and group chats, leading to disorganization and inefficiency. Our solution, Haven, is an augmented reality (AR) application with collaboration at its core. It allows users to visualize products in their own space and collaborate synchronously or asynchronously with others to make design decisions together.
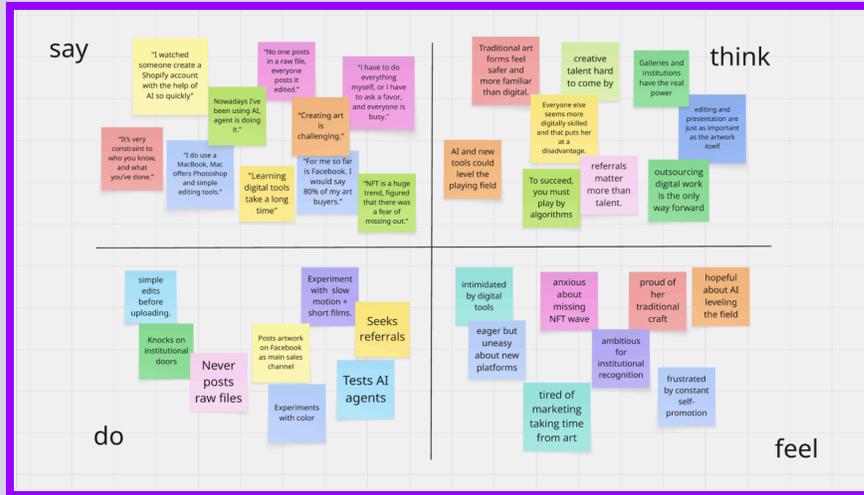
Needfinding

a. Interviews

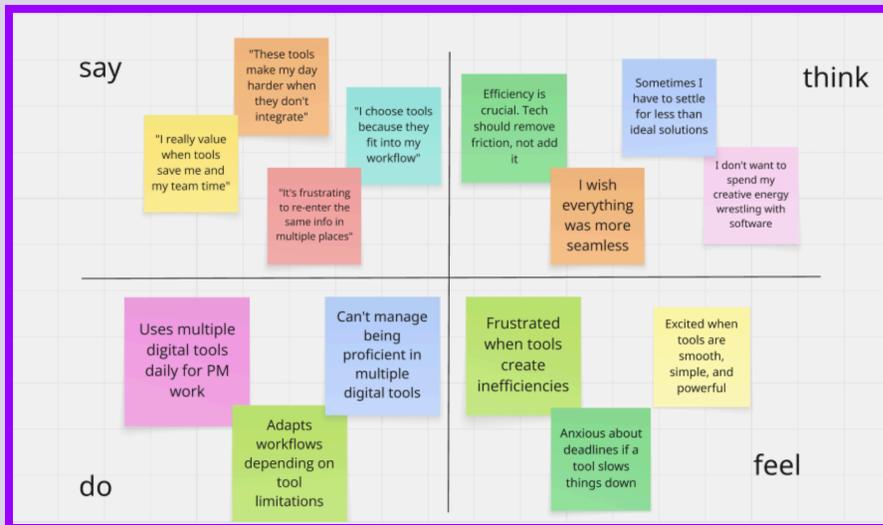We conducted five interviews with individuals in the broader creative logistics space. Our participants were:

- Jonah & Mona: Co-Owners of a mid-to-large-size home staging business.

Empathy map 1 (say / think / do / feel)

say: "It took a while to get off the ground"; "The staging is the advertising"; "I was buying furniture off craigslist on the way to a house"; "Efficiency is our differentiator"; "Improv or die"; "We acquired a good amount of realtors via sellers"; "Nothing matters more than the top 30 realtors"; "Top talent in SF all have jobs"; "Our in-house handyman is a differentiator"; "We thought we were going under maybe 10 times"; "We have to wine and dine the realtors"; "1% of realtors make 70% of deals"; "3 realtors account for 50% of our business"; "We recruit sellers, not realtors, via socials"; "If we say no, we risk losing realtor loyalty"

think: small team > big team; our investment is measured in decades; keep ops lean and cash-focused; do just enough; most of my business comes from only a few people; connections is the cornerstone; reciprocity with agents is key; talent is off-grid; momentum to launch, connections to stay around; formality isn't a necessity

do: network with new agents through existing; go straight to agency offices; take on jobs that go beyond just staging; keep a big inventory; move operations in-house; low-commit remodels; Office Suite; know the consumer segment; agree to jobs of all sizes; invest in people, not objects; shell out cash if necessary; take calls whenever-- even in the midst of interviews

feel: responsibility towards clients; move with the market; closeness toward repeat customers; addiction to the grind; our full-stack approach is our advantage; no difference between product and adverts; if we stop for a second, we will sink; physical investments aren't worth it; quality comes from thriftiness; cognizant of differentiation; gratitude for repeat customers

Empathy map 2 (say / think / do / feel)

say: "Ads on craigslist never work"; "The top realtors make stagers compete"; "Get the job done"; "If you don't follow market growth, you can tank your business"; "I took out 22 credit cards"; "We're not cheap, but we'll always say yes"; "Word of mouth is key"; "I can't survive without the designers"; "Realtors are the key"; "We haven't taken out loans since '08"; "80% are return clients"; "I'm part of a trade organization"; "We're not a commodity"; "Yelp sucks for advertising"; "All the good social media is done by realtors with too much time"; "I connect through my organization, and others connect me"

think: why would I network via socials?; creative talent hard to come by; reciprocity is the KPI; the market is too crowded to slow down; make connections with the biggest clients; my reputation is built on trust; paid ads are misaligned; invest in people and connections, not goods; getting in over our heads isn't a big deal; high risk, high reward; inventory is the portfolio

do: say yes now, think later; organize on a single platform; airtable and quickbooks use only; focus on small touches-- art, plants; don't go after socials; source clients through realtors; follow growth/shrinkage; expand carefully, with cash; prioritize personal relationships; 90 days staged free before rent

feel: proud of connections; weary toward adopting socials; supported by my trade org; nothing matters more than loyalty; tension with powerful players; total no on AI; if you can't adapt, you die; all-in attitude, at personal expense; socials are full of slop; reputation= durable, cash flow= fragile

- Emma: A professional artist working with large-scale paintings and NFTs.

Empathy Map 1 (say / think / do / feel)

say:
- "I watched someone create a Shopify account with the help of AI so quickly"
- Nowadays I've been using AI, agent is doing it."
- "No one posts in a raw file, everyone posts it edited."
- "I have to do everything myself, or I have to ask a favor, and everyone is busy."
- "It's very constraint to who you know, and what you've done."
- "I do use a MacBook, Mac offers Photoshop and simple editing tools."
- "Creating art is challenging."
- "Learning digital tools take a long time"
- "For me so far is Facebook. I would say 80% of my art buyers."
- "NFT is a huge trend, figured that there was a fear of missing out."

think:
- Traditional art forms feel safer and more familiar than digital.
- creative talent hard to come by
- Galleries and institutions have the real power
- Everyone else seems more digitally skilled and that puts her at a disadvantage.
- editing and presentation are just as important as the artwork itself
- AI and new tools could level the playing field
- To succeed, you must play by algorithms
- referrals matter more than talent.
- outsourcing digital work is the only way forward

do:
- simple edits before uploading.
- Experiment with slow motion + short films.
- Seeks referrals
- Knocks on institutional doors
- Posts artwork on Facebook as main sales channel
- Never posts raw files
- Tests AI agents
- Experiments with color

feel:
- intimidated by digital tools
- anxious about missing NFT wave
- proud of her traditional craft
- hopeful about AI leveling the field
- eager but uneasy about new platforms
- ambitious for institutional recognition
- frustrated by constant self-promotion
- tired of marketing taking time from art

- <u>Melanie:</u> A Stealth Startup Co-Founder and former Head of Product at Amazon.

Empathy Map 2 (say / think / do / feel)

say:
- "These tools make my day harder when they don't integrate"
- "I choose tools because they fit into my workflow"
- "I really value when tools save me and my team time"
- "It's frustrating to re-enter the same info in multiple places"

think:
- Efficiency is crucial. Tech should remove friction, not add it
- Sometimes I have to settle for less than ideal solutions
- I don't want to spend my creative energy wrestling with software
- I wish everything was more seamless

do:
- Uses multiple digital tools daily for PM work
- Can't manage being proficient in multiple digital tools
- Adapts workflows depending on tool limitations

feel:
- Frustrated when tools create inefficiencies
- Excited when tools are smooth, simple, and powerful
- Anxious about deadlines if a tool slows things down

- <u>Olivia:</u> Founder of Margins Market, with experience in fashion, sustainability, and branding.

Participants were recruited via Nextdoor, in-person at Verve Coffee in Palo Alto, and through cold outreach to our broader networks. Interviews were conducted in person at coffee shops, in the interviewee's home, or over the phone. No monetary compensation was provided. In each interview, one team member led the discussion while the other focused on transcription and note-taking using Apple Voice Memos and Google Docs.

b. Synthesis

Our synthesis of the interview data revealed several key insights about our user segment:

- **[Less important to our final solution]** Your connections determine your success: In industries prone to fluctuation, strong customer relationships and loyalty are more critical for longevity than rapid growth.

- **[Less important to our final solution]** Single point contacts lead to information bottlenecks: Relying on one person to coordinate all communication with vendors and team members manually slows down information flow significantly.

- **[More important to our final solution]** Digital creative tools often have high learning curves: Many professional tools are so complex that large companies employ specialists to master them, creating a barrier to entry for amateurs.

- **[More important to our final solution]** There's a missing link in creativity tools: Users expressed a need for a single, streamlined tool that could manage the entire creative process from initial inspiration ("vibecoding") to final execution, rather than juggling numerous disconnected apps.

POVs & Experience Prototypes

a. Final POV Statements

We developed three Point-of-View (POV) statements to guide our ideation:

- Cindy (The AI Collaborator): A digital native artist who uses AI as a collaborative tool to handle minor tasks, allowing her to focus on the core creative vision without compromising her artistic process.

We met... Cindy
- Programmer, digital artist, physical artist, and digital nomad
- Loves making products that combine physical and digital media with cultural themes.

*We were surprised to notice... that Cindy truly believes AI has a place in artistic creation.

Key takeaway: AI doesn't compromise Cindy's process. Instead, she uses it as a tool to help her do some light work during creation.

We wonder if this means... that Cindy feels that AI is a collaborator, it doesn't replace collaboration.

It would be game-changing... if every artist can look to AI as a collaborator.

- Alex (The Empowered Amateur): An aspiring architect who feels intimidated by the complexity of professional design tools and desires a simpler, more intuitive way to bring her sustainable design ideas to life.

We met... Alex
- Aspiring architect with interest in designing sustainably.
- Experience using tools like SketchUp and Autodesk

We were surprised to notice... even after passing the learning curve on multiple tools, she desires a simpler experience.

Key takeaway: Alex had to learn lots of hard digital skills to reproduce processes that are much simpler in the physical world, like using SketchUp instead of sketching.

We wonder if this means...
-If amateurs in the field feel intimidated by the complexity of these tools
-If professionals take the complexity of these tools for granted.

It would be game-changing... to flatten the learning curve for complex design tools.

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- Picasso (The Analog Traditionalist): A curator and artist from a traditional art background who is skeptical of digital tools and needs technology to enhance, not replace, the physical creative process and logistical planning.

We met... Picasso
- Curator for a child's art biennale
- Head of the art department at a Turkish university.
- Artist

We were surprised to notice... how much Picasso talked about the skepticism around digital tools in the art world.

Key takeaway: For older users in the art world, translating from the real world to the digital is not fully accessible—full of uncertainty and hesitation.

We wonder if this means... that creatives in the art world are worried that digital tools will replace their world.

It would be game-changing... if we found a product for which there's a need, but no job to replace.

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b. A Sampling of HMWs

From these POVs, we generated numerous "How Might We" (HMW) questions. The top HMWs for each POV were:

From Cindy:

- HMW position AI as a collaborator in the user's projects?

- HMW lower the barrier to entry for physical artists to use digital platforms?

From Alex:

- HMW support amateur digital users in design and architecture spaces?

- HMW integrate budgeting tools in creative workflows?

From Picasso:

- HMW unify different types of media like blueprints, photos, and mockups in the design process?

- HMW make digital design tools more accessible for older or non-digitally proficient users?

c. Top 3 Solutions from Brainstorming

Our brainstorming session yielded three primary solution directions:

1. User-to-User Collaboration Scheme: A platform that facilitates direct collaboration and mentorship between users, making design a social process.

2. Marketplace & Inspiration Integration: An app that integrates APIs from inspiration platforms (Pinterest, Instagram) and marketplaces (IKEA, Facebook Marketplace) to create a one-stop shop for finding and sourcing items.

3. Agentive AI Frontend: An AI-powered assistant that handles low-creativity tasks like budgeting and product selection, freeing the user to focus on creative decisions.

d. Brief Description of Each Experience Prototype

i. Prototype 1: User-to-User Collaboration

- Assumption Tested: That a collaborative design process smooths out the learning curve and enhances creativity by incorporating multiple perspectives.

    - Prototype Setup: We simulated a collaborative session where one user (Lolo) designed a space with real-time feedback from two collaborators (Sawsaw and Sasa). The collaborators provided input and suggestions verbally while viewing the design-in-progress.

- What worked/didn't + Implications: Communication was seamless and the flow of ideas was beneficial. However, managing two pictures at once was challenging and sometimes created "too much noise." This validated that collaboration is highly valued (one user said they "would have suffered greatly without" it) and should be a core feature, but the interface must be designed to manage multiple inputs clearly.

ii. Prototype 2: Marketplace Integration

- Assumption Tested: That aggregating options from multiple marketplaces in one view speeds up decision-making and provides a better sense of available options.
    - Prototype Setup: We had a participant (Dominique) search for a specific item by manually navigating several marketplace

websites (e.g., Amazon, Facebook Marketplace) simultaneously in different browser tabs.

- What worked/didn't + Implications: Participants found it very helpful to visualize options from different sources side-by-side, which widened their choices and quickened decisions. The difficulty was in the manual effort of navigating multiple tabs. This confirmed the value of a unified marketplace and inspired our "Budget + Style smart filters" and integrated product catalogs.

iii. Prototype 3: AI Frontend Integration

- Assumption Tested: That AI-driven, agentic tools can make the design process more efficient by automating tedious tasks like budget management.

- Prototype Setup: We acted as an AI agent for participants (Marta and Al). They gave us a budget and style preference, and we returned a curated list of furniture that fit their constraints.

    - What worked/didn't + Implications: Participants liked that the list stayed within budget, making the process efficient. However, some selected items did not fully meet their design vision, indicating that AI should assist with constraints but not override personalization. This led to our "Going forward" insight: Agentic tools should be implemented to improve product flow, but the user's choice and creative control must be prioritized.
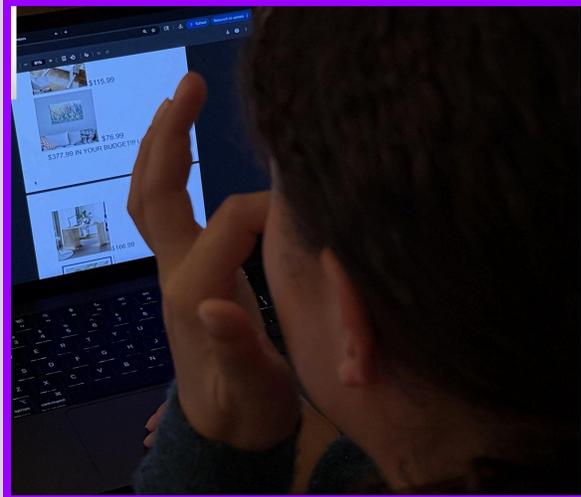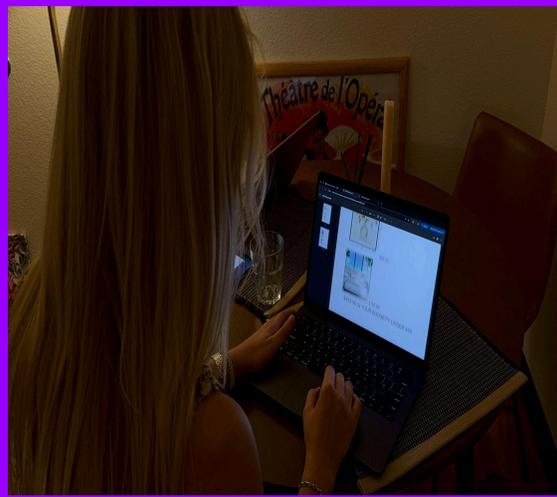
Design evolution

a. Final solution

Description: Our final solution was an AR and collaboration interior design app that lets users visualize furniture in their space and share photos of their layouts with friends in-app.

Rationale: During our needfinding, we came to an impass; we knew we wanted to create a logistics project that creatives used in their day to day lives. However, we felt that our interviewees used fragmented channels of communication, and which channels people used depended on their field of work and their age demographic (roughly). We saw that younger user bases were more interested in novel tools like AR and VR, and we liked these tools because they are fantastic ways of visualization in the design field. Initially we volleyed the idea of a VR solution around, but because we were approaching our solution from an accessibility standpoint, we ruled in favor of AR because every device that has a camera can use it, but VR applications need separate, expensive technology (headsets).

b. Tasks

    i. Tasks with complexity labels & descriptions on why it's important

        1. **[Simple task]** Plan an interior design layout

        2. **[Moderate task]** Get feedback on a design layout.

3. **[Complex task]** Organize feedback from multiple collaborators across time.

Rationale for why tasks are important to users

4. **[Simple]** Plan a layout

    a. Every user is going to need to do this in order to use the app. Users who want to use Haven need to visualize their space with prospective furniture, so using the app to accomplish this is a no brainer.

5. **[Moderate]** Get design feedback

    a. Via Needfinding/POVs, we noticed that lots of people were interested in having stakeholders comment on their designs. This is an important step in the interior design process, as stakeholders weigh in on designs and layouts made by the designer.

6. **[Complex]** Organize feedback from multiple collaborators across time.

    a. As design is iterative, and as things can change really quickly in interior design (even with the smallest addition/subtraction!), keeping track of feedback across time is crucial to our users.

[Simple] Task Annotated Workflow
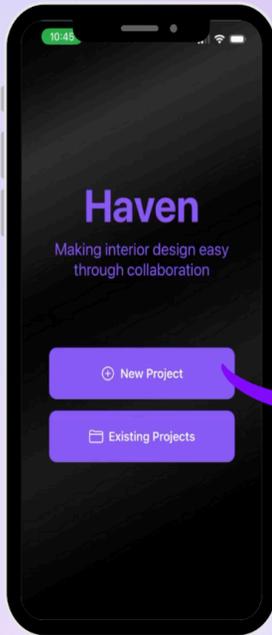
1. **Landing page**
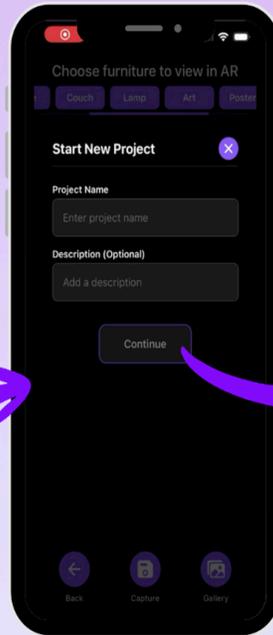
2. **Enter project name and description to open a new project.**
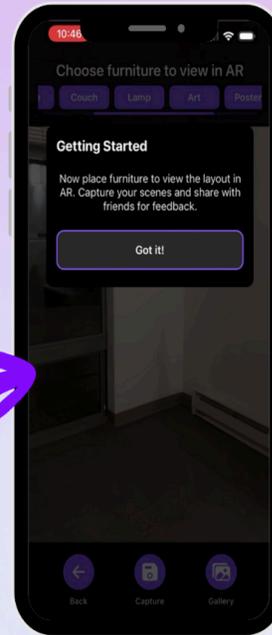
3. **Explanation message to help user navigate the application**
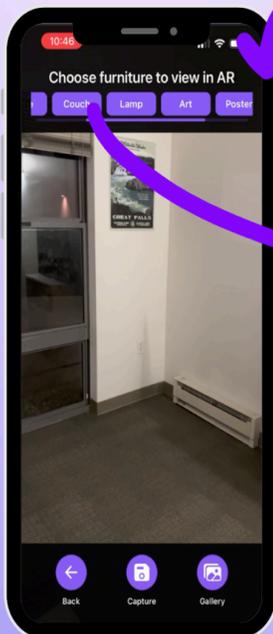
4. **Tap on the type of furniture you want to place in your room**
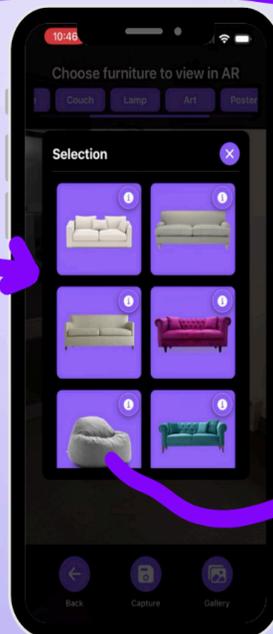
5. **Explore and select furniture options.**
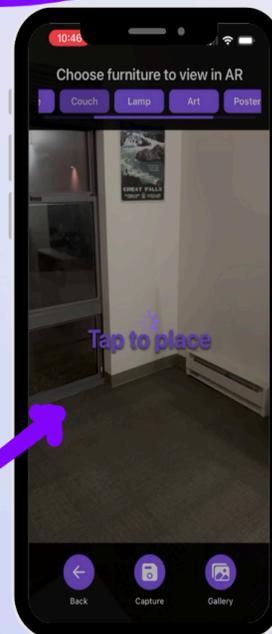
6. **Tap on the screen to place the selected furniture in your space.**
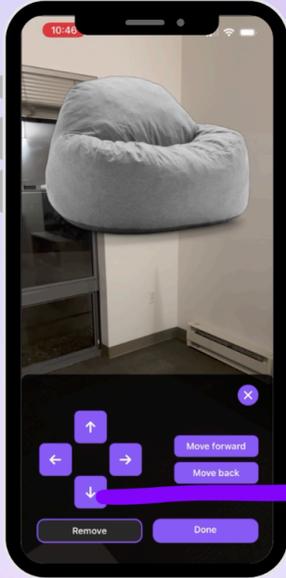
7. **Click on the buttons to move furniture up, down, left, right or forward or back**
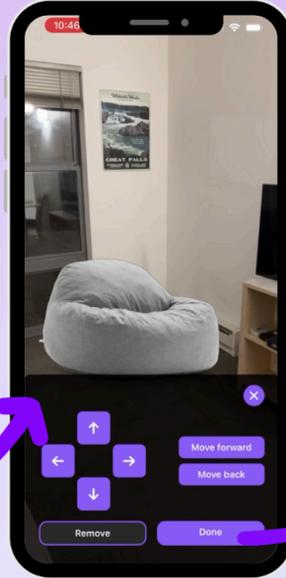
8. **(image to show how you can place the furniture when pressing buttons)**
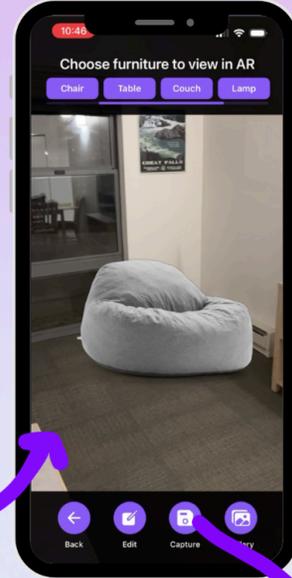
9. **Click on "Capture Image" to take a picture of the furniture in your space.**
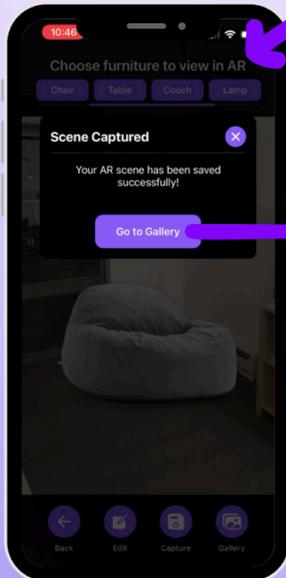
10. **Message confirming that you captured the image. When you press "Go to Gallery", you get directed to the gallery.**
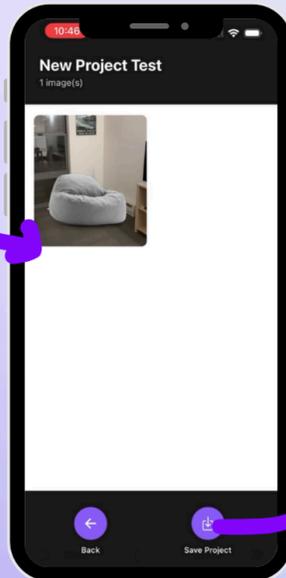
11. **The gallery that has all the images. Click "back" and go back to the AR scene and start from scratch. Click "Save Project" to save the project and share with friends.**
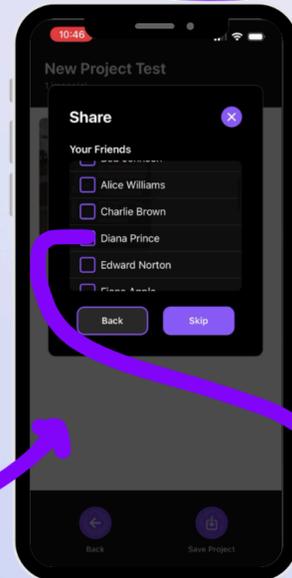
12. **Click on the box to pick which friends you want to share the project with.**
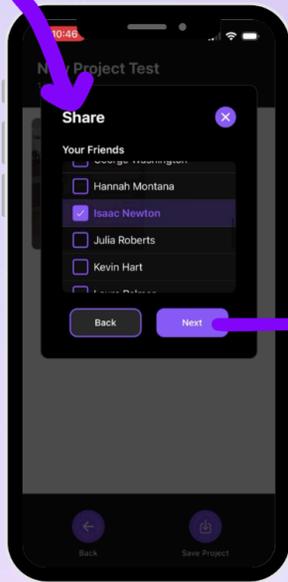
13. **After selecting friends, click next to share it with them.**
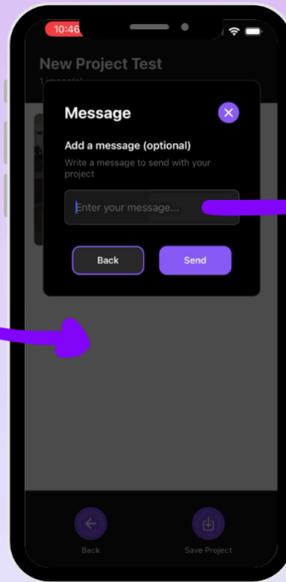
14. **Add message (optional) to send to your friends. Click "next" to share.**
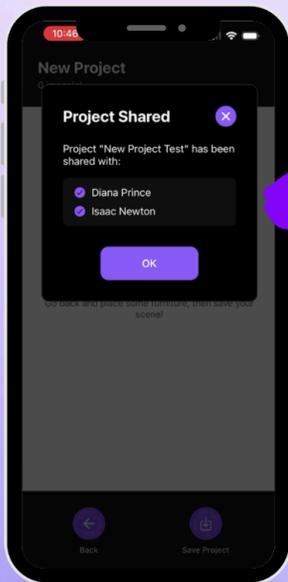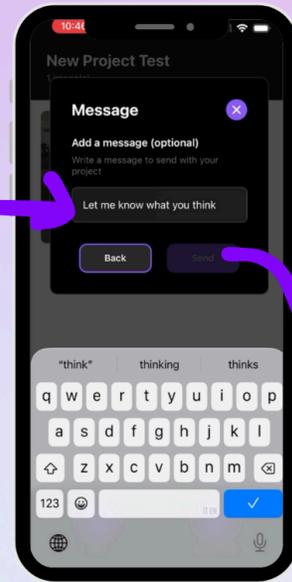
15. **Confirmation message showing which friends the project was sent to.**

[Moderate] Task Annotated Workflow & **[Complex]** Task Annotated Workflow

1. **Click "Existing Projects" to look at the projects you created.**

2. **You can see the projects you've created and click on them to see more information.**

3. **This page shows how many unread comments you have, as well as different images and more information about project. Tap on image to see more.**

4. **See where friends left comments by clicking "View Comments"**

5. **View comments by clicking on the comment icon.**

6. **View the comment. Either resolve it (delete it) or reply by clicking one of the buttons**

7. **Type your reply, click the send icon to go to the confirmation screen.**
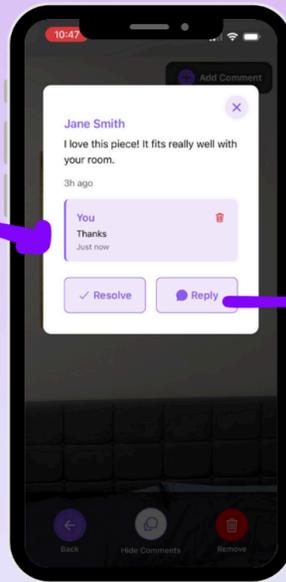
8. **The confirmation screen lets you either resolve the comment or send your reply.**
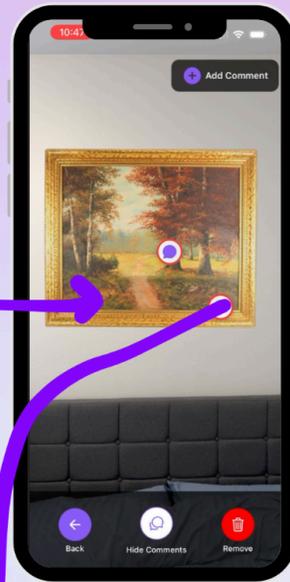
9. **Brings you back to the image to see other comments after you're done replying/resolving Click on any comment to see what it is.**
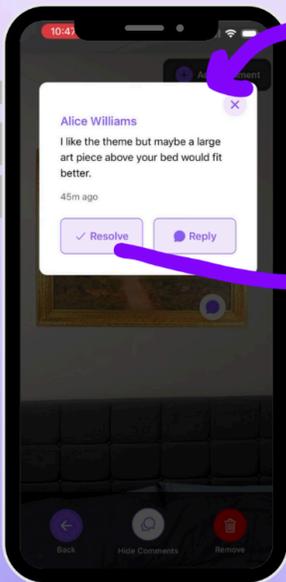
10. **Click on resolve to delete comment.**

10. **Comment is deleted from the image. Click the back icon to get back to the project page.**
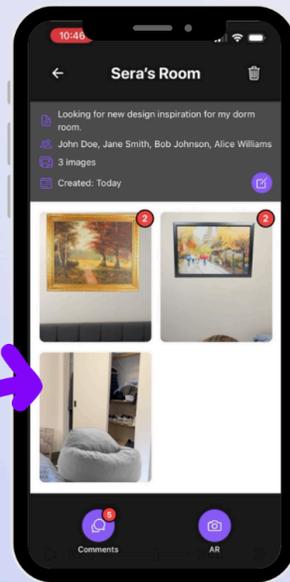
11. **Click another image to view it/look at the comments.**
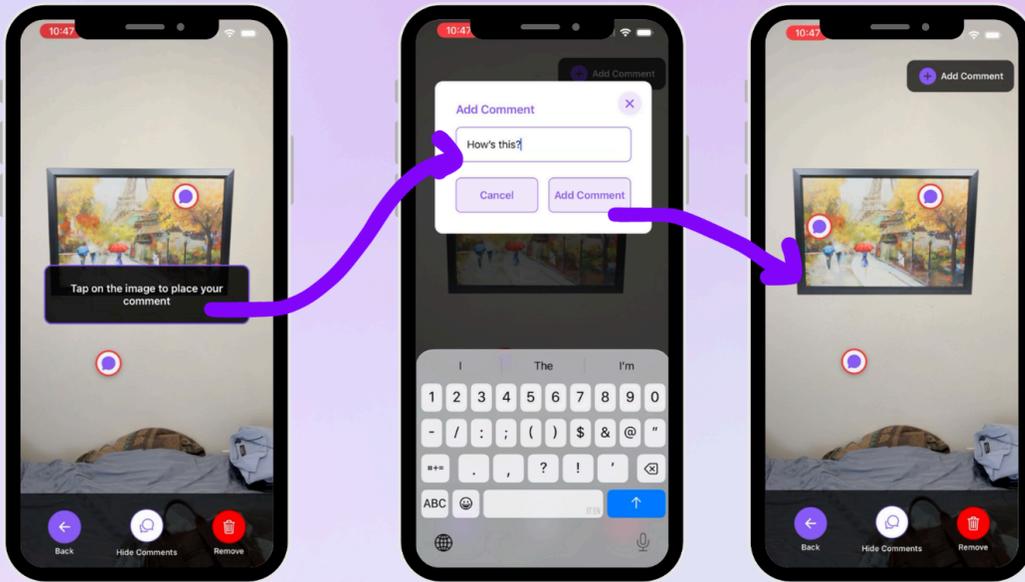
12. **Tap on the screen to add a comment or click on the "Add Comment" button on top right.**

13. **Add comment by typing it then clicking "Add Comment".**

14. **Your new comment appears on the image.**
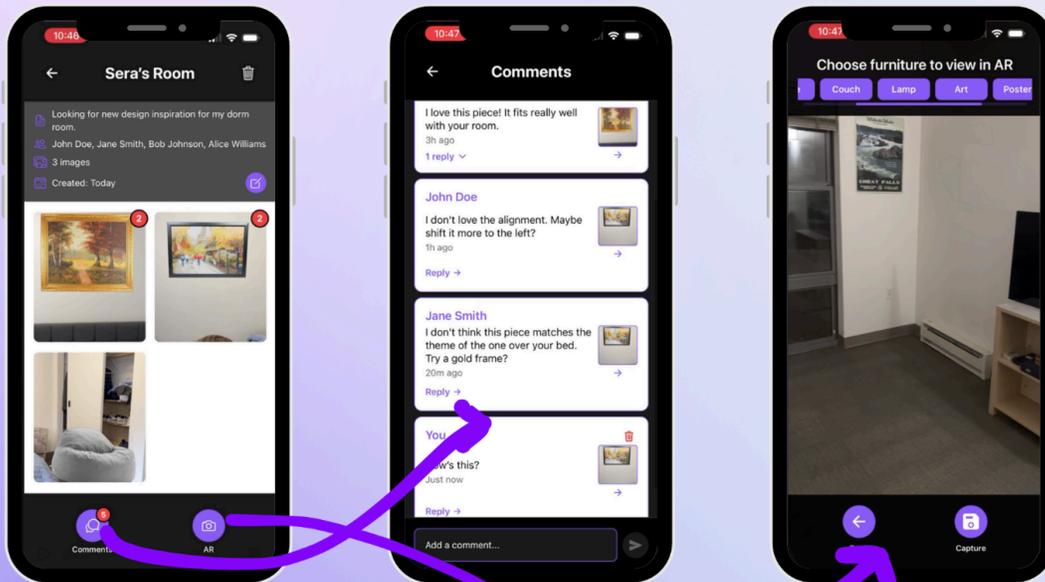
15. **Click on the "comments" icon to view the comment feed starting from newest comments.**

16. **Click on "AR" to add another picture for the project.**

Design Evolution Visualization(s) & Rationale

i. What we learned and how the UI improved
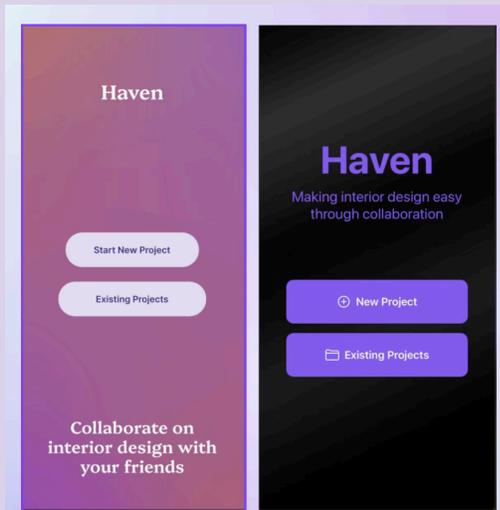
1. Home page

Through heuristic evaluation and cognitive walkthroughs, we learned that the mid-fi home screen didn't have a clear hierarchy, the buttons looked too similar, and the overall style didn't match what Gen-Z users expect. Users were unsure where to start. In the hi-fi, we added a more modern gradient, clearer typography, bigger rounded buttons, icons, and a simple tagline to make the actions easier to understand and the screen more inviting.
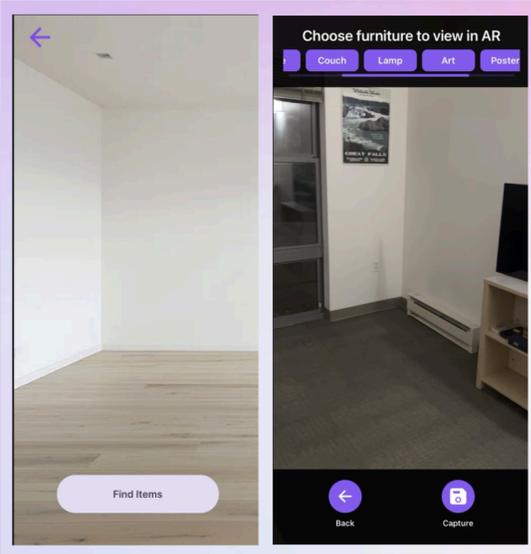
2. Room scan

Users didn't understand the room-scan flow in the mid-fi version. They weren't sure where to press, how to move the phone, or how to stop the scan, and many got stuck on this screen. Because the scan created more confusion than value, we removed it entirely in the hi-fi and replaced it with a simpler AR interface where users can pick a furniture category and capture photos directly. This made the interaction much clearer and eliminated the scanning problems users struggled with.
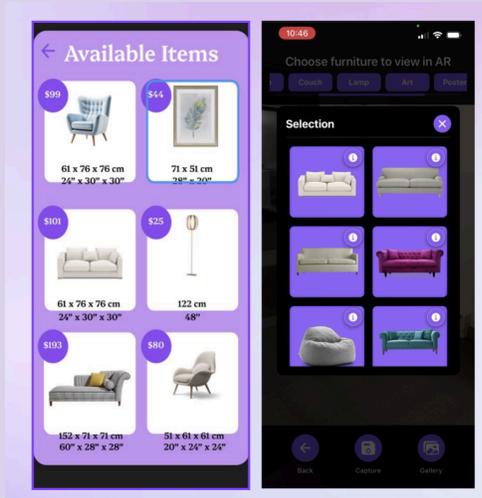
3. Furniture catalogue

Users indicated that the item catalog felt crowded and overwhelming, with too much text, too many numbers, and no clear sense of what to focus on. This made it difficult to browse or compare items. In the hi-fi, we reduced clutter by moving details into small info icons, simplifying the layout, and emphasizing visuals to support more focused browsing. We also added clear categories like "Lamp" and "Couch" so users can jump directly to the type of furniture they want. These changes made the catalog easier to scan, faster to navigate, and far less cognitively demanding.
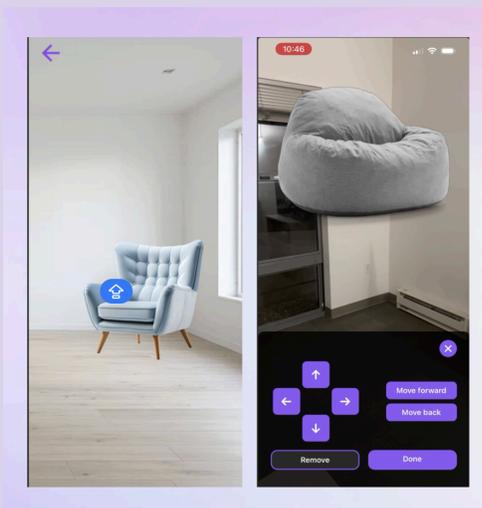
4. Placing a furniture

Users struggled with the mid-fi version because the interaction for placing furniture in AR wasn't clear, people didn't know how to adjust the item or whether it had been placed correctly, which led to lots of guessing. In the hi-fi, we introduced clearer controls with directional arrows, labels like "Move forward" and "Move back," and visible buttons for removing or confirming

placement. These changes gave users more precision, made the interaction feel predictable, and increased confidence when positioning items in the room.
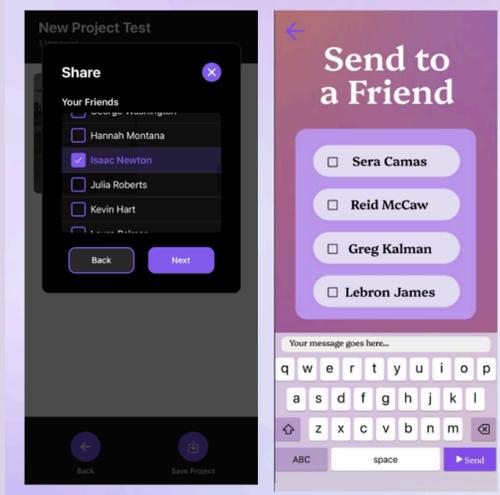
5. Share layout with friends

Users told us the mid-fi sharing screen felt cramped and text-heavy, and it became hard to distinguish who was selected versus unselected when choosing friends. The layout also didn't scale well once we added more than a few friends, and there was no clear primary action, which made the flow feel confusing. In the hi-fi version, we redesigned the screen to feel more open and social, added clearer selection states, and introduced a simple message box and send button. These changes made sharing feel more intuitive, easier to navigate, and better suited for larger friend lists.
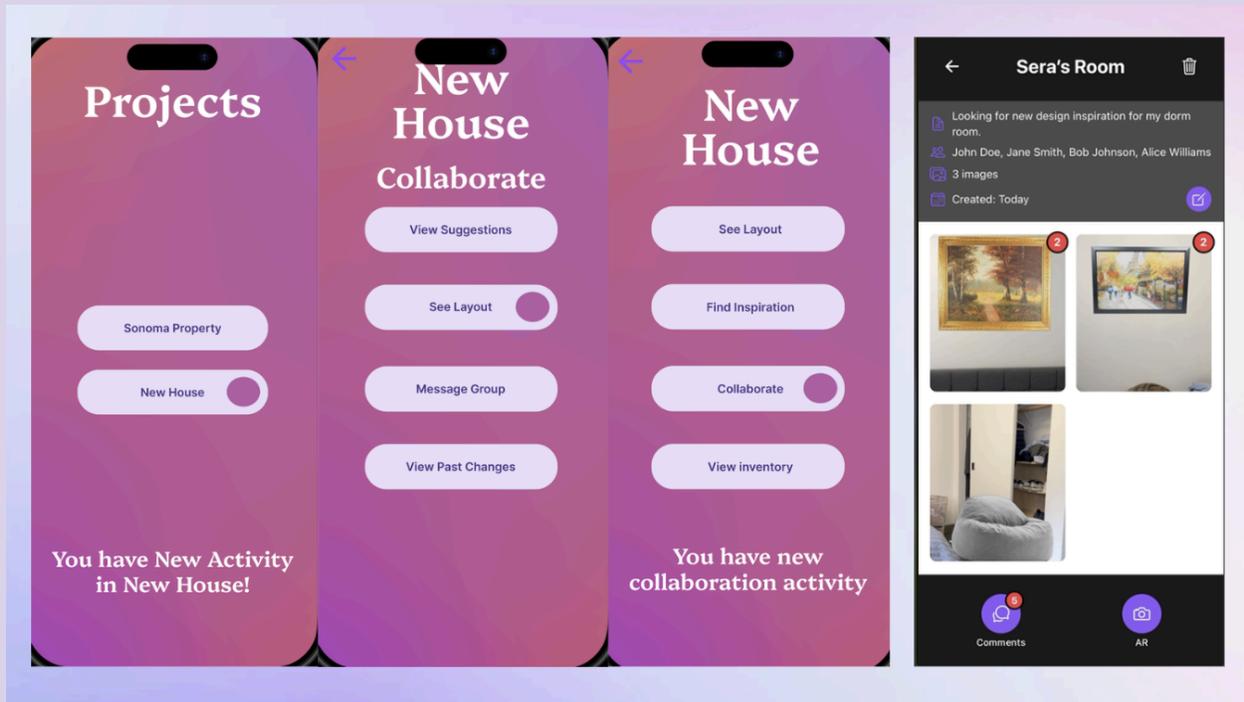
6. Get feedback from friends

Users told us that the mid-fi flow for navigating projects was confusing because there were too many similar-looking screens with almost identical button names. People weren't sure where to go to see comments, layouts, or suggestions, and the repeated options made the flow feel cluttered and hard to follow. In the hi-fi, we removed these multiple screens and replaced them with one simple project page that shows all project info, new comment counts, and quick access to AR and the gallery. This made navigation much clearer and helped users understand everything happening in their project at a glance.
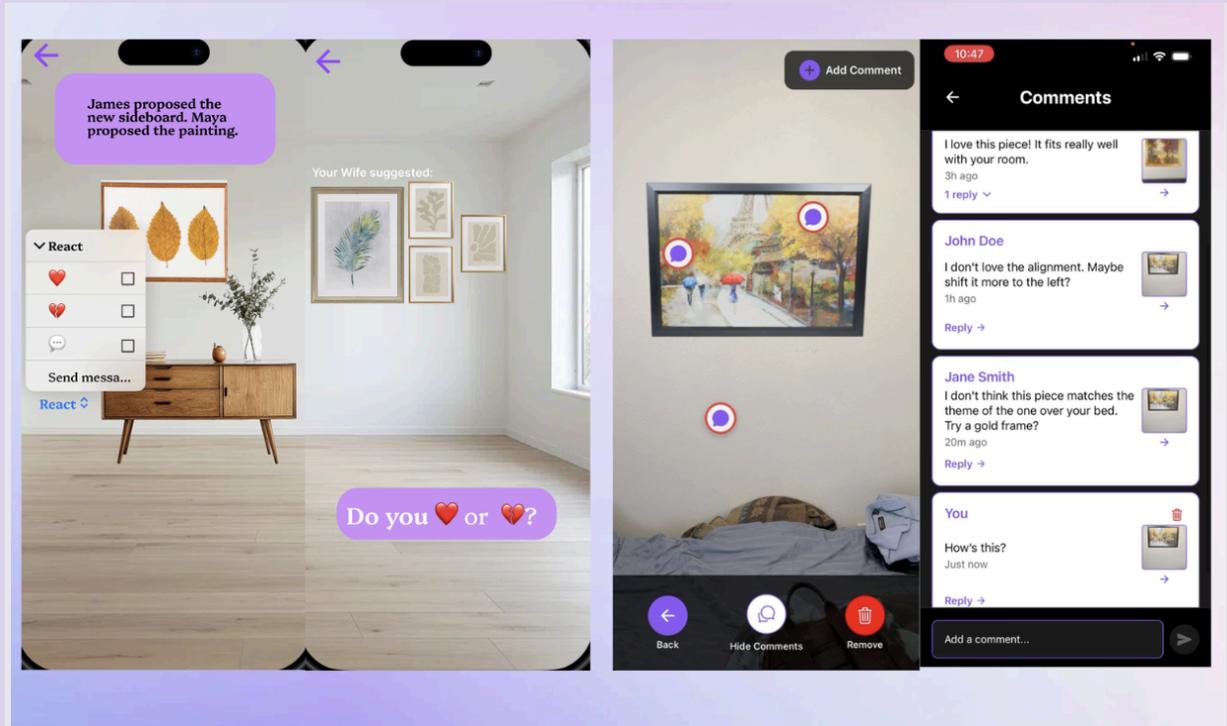
7. Send a message

Users found the reaction system in the mid-fi confusing because there were only a few emoji options and no clear way to tell which feedback was new or important. People also struggled to understand the order of comments and often missed updates. In the hi-fi, we replaced reactions with a clearer comment system, added red outlines to AR comment icons for unread feedback, and introduced a dedicated feed that prioritizes new messages. We also added the ability to place a comment anywhere on the AR scene, giving users more control over leaving precise, location-based feedback. These changes made collaboration easier to follow, more expressive, and far more organized.
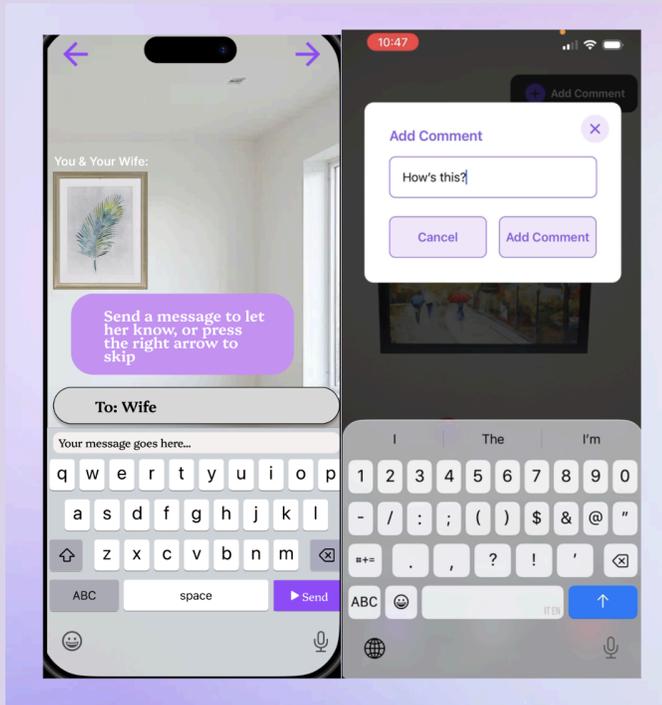
8. Send a message

Users found the mid-fi comment screen visually confusing because it looked like a full messaging page rather than a quick feedback tool. The large text bubble, the "To: Wife" label, and the full keyboard all competing for space made the layout feel heavy and pulled attention away from the AR scene. The design didn't match the lightweight, collaborative feel we wanted. In the hi-fi, we redesigned this into a small, clean modal with clear buttons and a simple text field. The modal floats above the AR view, uses more modern spacing, and avoids unnecessary labels. This made the design feel lighter, more intentional, and more aligned with the rest of the app's visual language while keeping the user focused on the placement they're commenting on.

ii. severity 3 or 4 heuristic violation found by the evaluators

<u>Fixed Violations</u>

1. **SIMPLE TASK**

H1 – Visibility of System Status: [3] "Right now, once we hit the record button, we just scan and then eventually press the button again so the recording stops. I am not entirely sure when the scan is finished."

→ We ended up not implementing a room scan feature, so this is not relevant.

H5 – Error Prevention: [3] When the user is scanning the room, they press the record button once to start, and it is intuitive to press the record button again to end it, and then it goes straight into the layout. There lacks a confirmation page or a way to ask for a rescan if an error occurs.

→ We retired our room scan feature.

H5 – Error Prevention: [3] Users are able to move off of the AR grid outside of the room's boundaries without any warnings or constraints.

→ We retired our room scan feature.

H2 – Match Between System and the Real World: [3] The interface uses a play/pause icon, but it is unclear what action will occur when the button is tapped, users do not know what they are "playing" or "pausing."

→ We ended up not using a scan feature because it was irrelevant to the AR program we used in our hi-fi prototype.

H7 – Flexibility and Efficiency of Use: [3] When scrolling through the catalog to test out new items, once I click in, and if I don't want to try the item, if I hit the back arrow, I am brought back to the layout page and have to reclick into find items.

→ Once you hit the back arrow, you return to the item page which you were viewing.

H11 – Accessible and Inclusive Design: [3] Right now all the measurements of the items in the simple task are by inches, which is great for Americans, and terrible for so many.

→ We implemented metric units!
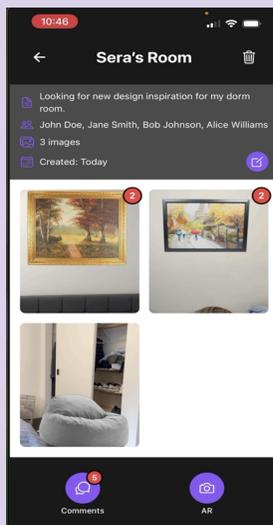
H7 – Flexibility and Efficiency of Use: [4] When creating a new design, users are required to start from scratch rather than duplicating or reusing an existing layout.

→ Instead of starting the layout from scratch, the user now has the option to delete photos from their layout gallery.

2. MODERATE TASK

H1 – Visibility of System Status: [3] For some pages (like the New House page), there is a text notification to tell you where to press, but once we are in, it doesn't indicate which task to complete. There is a lack of text description.

The text description also isn't a strong method. There is no visual indicator or a button to navigate to with a clear action to do even when there is text.
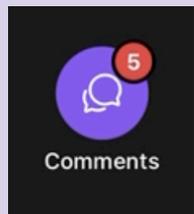

→ We implemented different ways of notifying the user that there is activity, such as a red circle around the comment button in frames 12 and 14 of the moderate/complex tasks.

H1 – Visibility of System Status: [3] For some pages (like the New House page), there is a text notification to tell you where to press, but once we are in, it doesn't indicate which task to complete. There is a lack of text description. The text description also isn't a strong method. There is no visual indicator or a button to navigate to with a clear action to do even when there is text.

→ We implemented different ways of notifying the user that there is activity, such as a red circle around the comment button in frames 12 and 14 of the moderate/complex tasks.

H1 – Visibility of System Status: [3] When users send a message, it just says message sent and users don't know where it goes, who it does to, or how to access it afterwards.
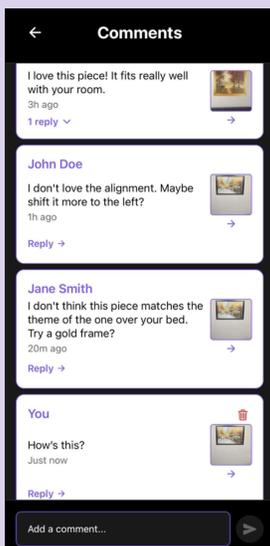

→ We were surprised to see this because our med-fi had some version control/comments control. We implemented a more robust comments page such as in frame 15 of the moderate/complex task flow above.

H1 – Visibility of System Status: [3] After tapping "Send," a "Message Sent" confirmation appears immediately, but the app freezes on that screen for around 5 seconds before navigating back without any loading feedback. Users cannot tell whether the app is processing or stuck

→ We shortened the freezing time to account for this.

H10 – Help and Documentation / Clarity: [4] The buttons "View Suggestions" and "See Layout" appear to represent different actions, but both lead to nearly identical screens showing suggestions and prompting the user to react.

→ We overhauled our design away from "View suggestions" and "see layout" pages.
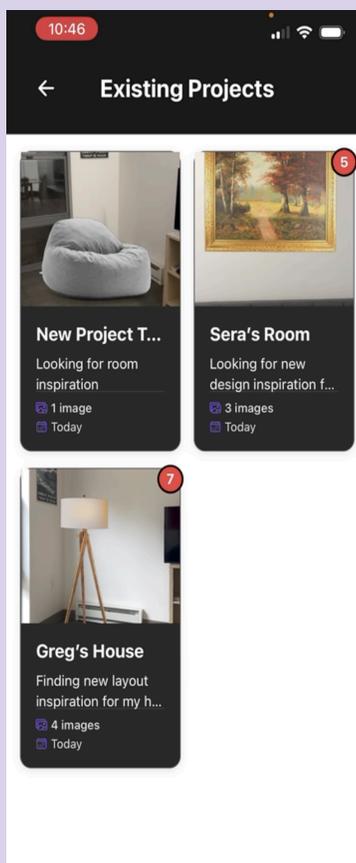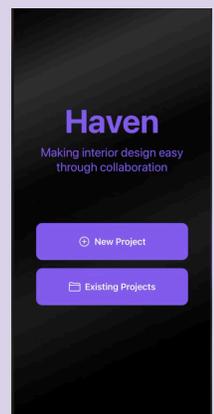
H3 – User Control and Freedom: [4] When a user presses on existing project from the home page, there is no pathway to get back to the homepage if you want to start a new project.

→ We made such a pathway! (click on top left back button)

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no pathway to get back to the homepage if you want to start a new project.

→ We made such a pathway! (click on top left back button)

3. COMPLEX TASK

H5 – Error Prevention: [3] 1. I can check multiple reactions, which seems to defeat the purpose of checking boxes. 2. After I check a box, I cannot uncheck the boxes, which also is a problem.

→ We changed our "reaction" menus to a text box for comments.

H1 – Visibility of System Status: [3] In the suggestions, I can't tell in the space which react is like new and old. There is just the option to click on react, but there is no indication of urgency/newest suggestion. Are all suggestions always new?

→ Similar to the above redesign, we overhauled the notification signals. All comment buttons with a red border are new, with the border disappearing after viewing/acting on the comment.
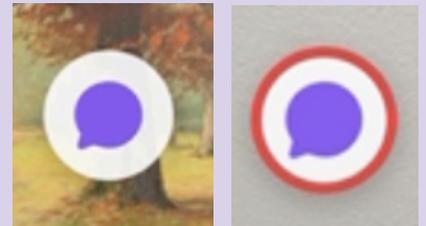
H7 – Flexibility and Efficiency of Use: [3] There's no quick navigation to jump between feedback sections, instead you must head to AR mode to view each one at a time manually.

→ Due to the overhaul of our comment-leaving methods, you are now able to see comments all at once without jumping back to the AR screens.

H11 – Accessible and Inclusive Design: [3] Action buttons have no icons or logos, making them difficult to tell apart.
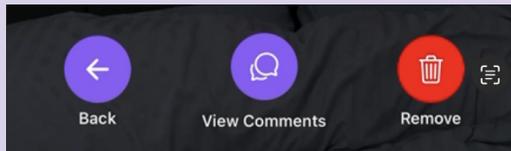
 → They now have icons!

H7 – Flexibility and Efficiency of Use: [4] After the message has been sent, we immediately return to our project page, which ones again inhibits a user from doing these tasks fast and if they have multiple. I imagine that there can be multiple notifications at once, in the same way I leave lots of comments on Figma at one time for my team to see later.

> → After leaving a comment (no longer sending a message), the user stays on the same page they were commenting on. This increases user freedom and allows for the user to speed-run leaving multiple comments.

4. ALL TASKS

H12 – Value-Sensitive Design / Privacy: [3] There is a concern of privacy when asking users to scan their personal living spaces. The app does not state who owns digital scans of a user's living space or how they are stored/shared.

→ We retired our room scan feature. Due to the project's prototype nature, no information about the room viewed in AR is saved.

H3 – User Control and Freedom / H4 – Consistency: [4] When users press back arrows, they don't always go back to the previous screen. Instead they would jump all the way to the start of the flow or they would just exit a house file.

→ We implemented much more robust navigation throughout the hi-fi.

The room scan feature is deactivated, we implemented an AR scan where you can capture images of which part of the room you want to send rather than sending everything. This was mentioned the most in our heuristics.

Non-Fixed Heuristic Violations

1. **SIMPLE TASK**

H3 – User Control and Freedom: [3] After placing furniture in AR, there is no option to undo or remove the item without restarting the scan.

> → Instead of the user placing/re-placing furniture in a single session, we intended for the users to take multiple images, say, of the same couch in multiple positions, and send those for feedback. Because of technical limitations (we can only place one piece of furniture at once), a "layout" consists of multiple photos.

H1 – Visibility of System Status: [3] The camera closes automatically after completing a scan.

> → There is no more scan functionality, see the fixed violation above starting with "The interface uses a...".

H5 – Error Prevention / H9 – Help Users Recognize & Recover from Errors: [4] It was interesting that you guys kept track of the sizes of the furniture but did not keep track of the sizing of the room. The app does not warn the user when an item is too large to fit in their scanned room, and provides no explanation after placement fails or overlaps occur.

> → Because we retired the room scan feature, this is a shortcoming of our hi-fi prototype. Ideally, a more robust AR scan feature would be able to

simultaneously keep track of room size and furniture size, but due to technical/time limitations we did not implement this.

2. MODERATE TASK

H3 – User Control and Freedom: [3] Users cannot edit or delete feedback comments once submitted in a project thread.

> → While editing feedback might have been important, we feel that in the interior design process, deleting feedback is not a good move: we want the user to have the *full* log of ideations/feedback rounds.

H2 – Match Between System and the Real World: [3] There is no way to explain how we add relation to people. Right now on the screen it says suggested by your Wife. How do I assign someone in my friends to be my wife?

> → This was definitely a shortfall in our prototyping. Having "your wife commented X" was confusing to the user. We ended up not implementing relationship features in the scope of our project. Your might have your wife as a collaborator, but the app does not know that

3. COMPLEX TASK

H7 – Flexibility and Efficiency of Use: [3] When managing multiple feedback threads, users must react to each comment one by one, with no batch or multi-select option.

→ The user now doesn't need to "react" to anything, they can simply view or comment on the feedback.

H1 – Visibility of System Status: [3] Throughout the tasks, I must just click around to find what needs to be attended to. Beyond the text instructions, the interface doesn't necessarily point me to what I really need to go to.

→ We simplified both the home UI and the notification signals to make this more clear.

4. ALL TASKS

H7 – Flexibility & Efficiency / H10 – Help & Documentation: [3] There is no account creation step for me to set my preferences for the app. This app immediately jumps into the homepage, without a way to sign in or create an account.

→ For hi-fi demo purposes and hard-coded friends in our hi-fi prototype, we deemed this unnecessary.

H10 – Help and Documentation: [3] Unclear way of how to add friends in this app. My friends are preloaded (which is great), but I am unsure how they became my friends.

→ We had a really hard time implementing this in ReactNative, so we ended up hard-coding friends.

Values in Design

<u>a. values identified in the solution & their implementation</u>

Throughout Haven's development, we consistently returned to three guiding values: supporting user creativity, making collaboration intuitive and trustworthy, and ensuring the experience remains accessible to as many people as possible. These principles helped us make decisions at moments when trade-offs emerged, whether about interaction flow, visual hierarchy, or even the underlying technology we chose to build the prototype around.

- **Creative Empowerment and Clarity**

A foundational goal for Haven was to help users feel capable and confident as they visualize and refine the look of their spaces. Interior design can be intimidating, especially for young adults furnishing their first apartments, so our interface had to make the process approachable, playful, and structured enough to support decision-making.

To foster empowerment and clarity, we integrated:

- Undo/Redo, Remove, and Rescan controls in AR, providing users freedom to experiment without fear of making irreversible mistakes.
- Clear step-by-step flows (scan → browse → preview → place), reducing uncertainty around what happens next.

- Item previews and confirmations before placement, ensuring users understand the impact of each design choice.

- Duplicate Layout features, enabling users to create variations of the same room and build confidence in comparing different design paths.

- **Collaboration and Trust**

Haven grew out of a real behavioral pattern: people already send dozens of photos to group chats, hoping for feedback. Yet these conversations are scattered, easily lost, and not designed for visual decision-making. We wanted to formalize this social process while preserving its authenticity and conversational quality.

To support collaboration and trust:

- Clear identity cues (names on suggestions, profile details, and indicators of who added what), reinforcing personal accountability and relational warmth.

- Reaction and commenting tools that feel expressive but not overwhelming, encouraging candid feedback without formality.

- Badges and markers for new updates, prompting users to return to the right place without digging through screens.

- Editable and deletable messages, acknowledging that design conversations evolve and miscommunications sometimes happen.

- **Accessibility and Inclusivity (AR Over VR)**

We wanted Haven to be accessible to as many people as possible—regardless of budget, visual needs, or familiarity with design tools. This value motivated our technical, visual, and platform-level decisions, including our deliberate choice to use augmented reality instead of virtual reality.

Why AR Instead of VR?

- AR uses devices people already own, avoiding expensive VR headsets that could exclude students and renters.
- AR situates furniture inside a real room, helping users feel grounded in their actual space rather than navigating an abstract simulation.
- AR supports shared usage, allowing users to co-design with friends without isolating themselves in a headset.
- AR reduces motion sickness and physical accessibility barriers that VR can introduce.

Other accessibility commitments:

- High-contrast icons, improved legibility, and consistent layouts to support users with varying visual abilities.
- Clear AR instructions and progress indicators, reducing anxiety for first-time users.

- Filters and categories in the furniture catalog, making browsing manageable even for users who feel overwhelmed by too many choices.
- Culturally diverse and budget-diverse items to ensure Haven feels relevant to people with different aesthetic backgrounds and financial situations.

b. Value tensions

Designing Haven required navigating several value tensions. Below are the most significant ones and how we addressed (or plan to address) them.

Simplicity vs. Expressiveness

A minimalist interface supports usability, but design collaboration requires nuance, comments, reactions, messages, and metadata.
→ We used progressive disclosure, keeping AR placement simple while allowing richer interaction within feedback in another page (existing projects).

Accessibility vs. Immersion (AR vs. VR)

VR offers immersive design experiences, but creates financial, physical, and cognitive barriers.
→ We intentionally chose AR, embracing accessibility, affordability, and inclusivity over cutting-edge immersion. VR may one day enhance Haven, but not at the cost of widening the user gap.

Privacy vs. Social Sharing

Users benefit from sharing designs with collaborators, but scanning a home is inherently sensitive.

→ clear indicators of who the content is sent to,

→ and plans for more granular sharing controls in future iterations.

Conclusion

By embedding creative empowerment, collaboration and trust, and accessibility and inclusivity into its core, we aim to make interior design feel approachable, social, and personal. These values shaped everything, from our decision to use AR instead of VR, to how users navigate, collaborate, and express themselves in the space.

Where tensions emerged, we used value-sensitive design to find balanced solutions that protect the user's agency, safety, and sense of belonging. Haven is not just a tool for decorating rooms, it is a platform built around the values that matter most to real people designing real homes.

7. Final prototype implementation

   a. Tools used; pros and cons of these tools

    i. The final prototype used ReactNative and the ReactViro AR toolkit. The toolkit limited our AR features to stable views with not many moving objects or planes in the frame. Such a tool can only capture one plane at a time, so we were limited to placing one piece of furniture at a time. The final used AsyncStorage in order to not use a database and keep everything stored on frontend for speed and simplicity.

  b. Wizard of Oz techniques used

    i. Comments left by friends and the pre-loaded projects "created" by the user are Wizard of Oz features.

  c. Hard-coded techniques used

    i. Comments, friends, furniture, and furniture info are all hardcoded.

  d. AI tools used with justification of why

    i. We used cursor to help implement the technical aspects of implementing the AR toolkit and ensuring continuity across the project with styling and actions.

8. Reflection & next steps

  a. What were your main learnings from this quarter about the design thinking process, your studio theme, and your own project?

We have learned an immeasurable amount over the last 10 weeks. Most important to us was the iterative process of testing assumptions, learning from users, and re/drafting our design. We were *so* lucky to be in a great

studio with an amazing CA, and learning about creative users and their needs was illuminating and massively fun. We found it such a challenge to create tools for users in creative spaces, especially because "creativity" is not one workflow but many, shaped by age, industry, confidence, and tolerance for complexity. Our needfinding taught us that the real pain point wasn't a lack of inspiration, but the friction of moving from inspiration to execution across scattered tools and chats. That insight shifted our project from a broad "creative logistics" idea into a focused, socially grounded interior-design experience where AR is not the novelty, but the enabler of shared decision-making. We learned to treat accessibility as a product constraint, not a slogan, choosing AR over VR because it lowers cost and device barriers. Finally, we learned that collaboration is powerful but noisy; designing for collaboration means building structure (clear comment states, versioning, and lightweight organization) so feedback helps rather than overwhelms. Overall, Haven became our proof that strong HCI outcomes come from narrowing the problem, honoring real user behavior, and letting evaluation drive the next iteration.

b. If you had more time, what might you add in the future?

With more time, we would add three things. First, a better collaboration system with threaded comments on specific objects, version history, and side-by-side option comparisons to make feedback easier to manage. Second,

improved AR capabilities including better plane detection, multi-item room placement, and shared AR sessions for real-time co-design. Third, smarter budgeting tools like price tracking across retailers, sustainability filters, and personalized recommendations to help users go from planning to purchasing. These features would strengthen Haven's core goal: making interior design more collaborative, practical, and realistic within real budgets and shared spaces.

Acknowledgements

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