

ASSEMBLEIFY



Tools



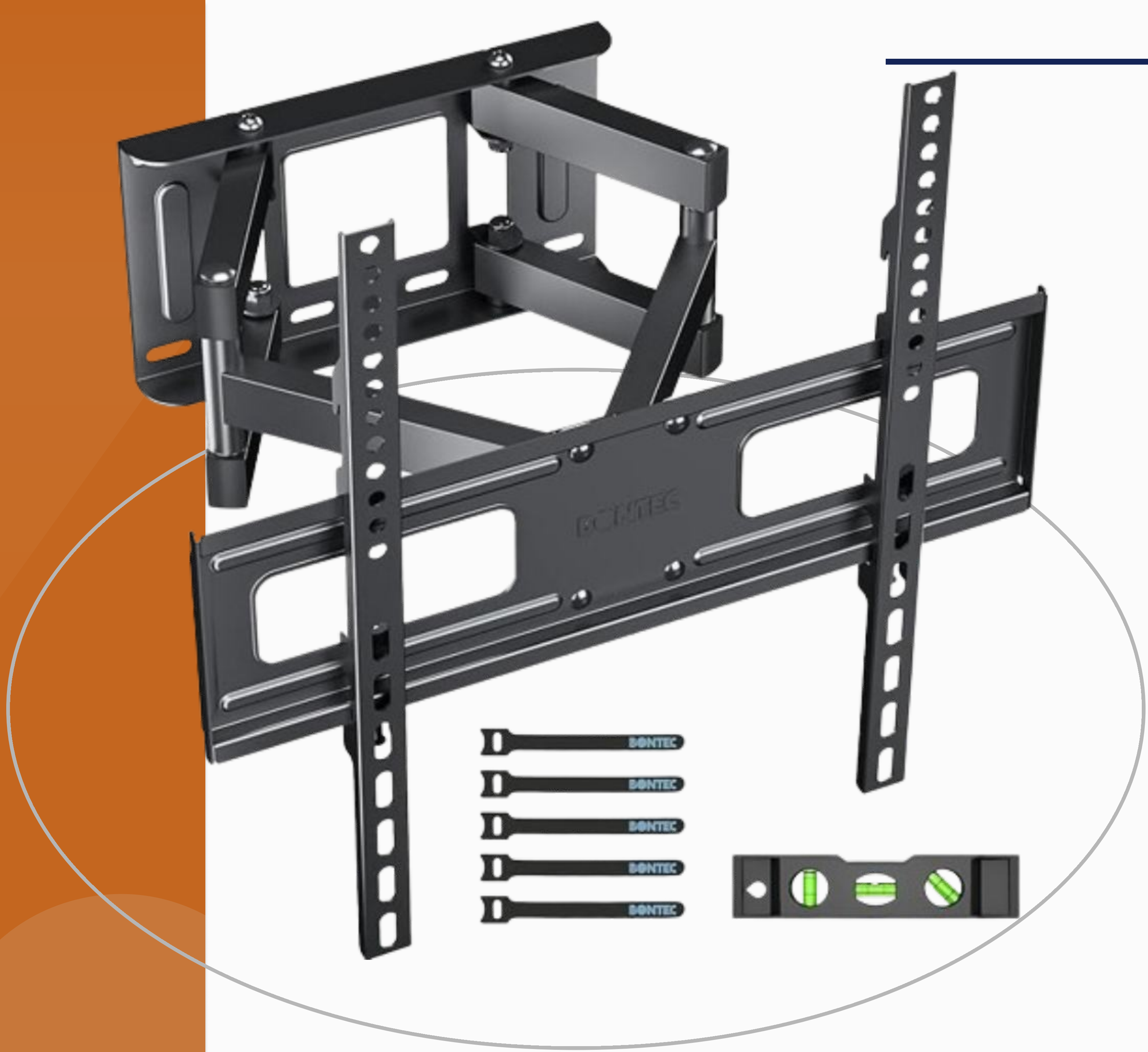
Introduction

—
The Problem

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Why AR

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Why Mobile phone

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Proposed



The Problem

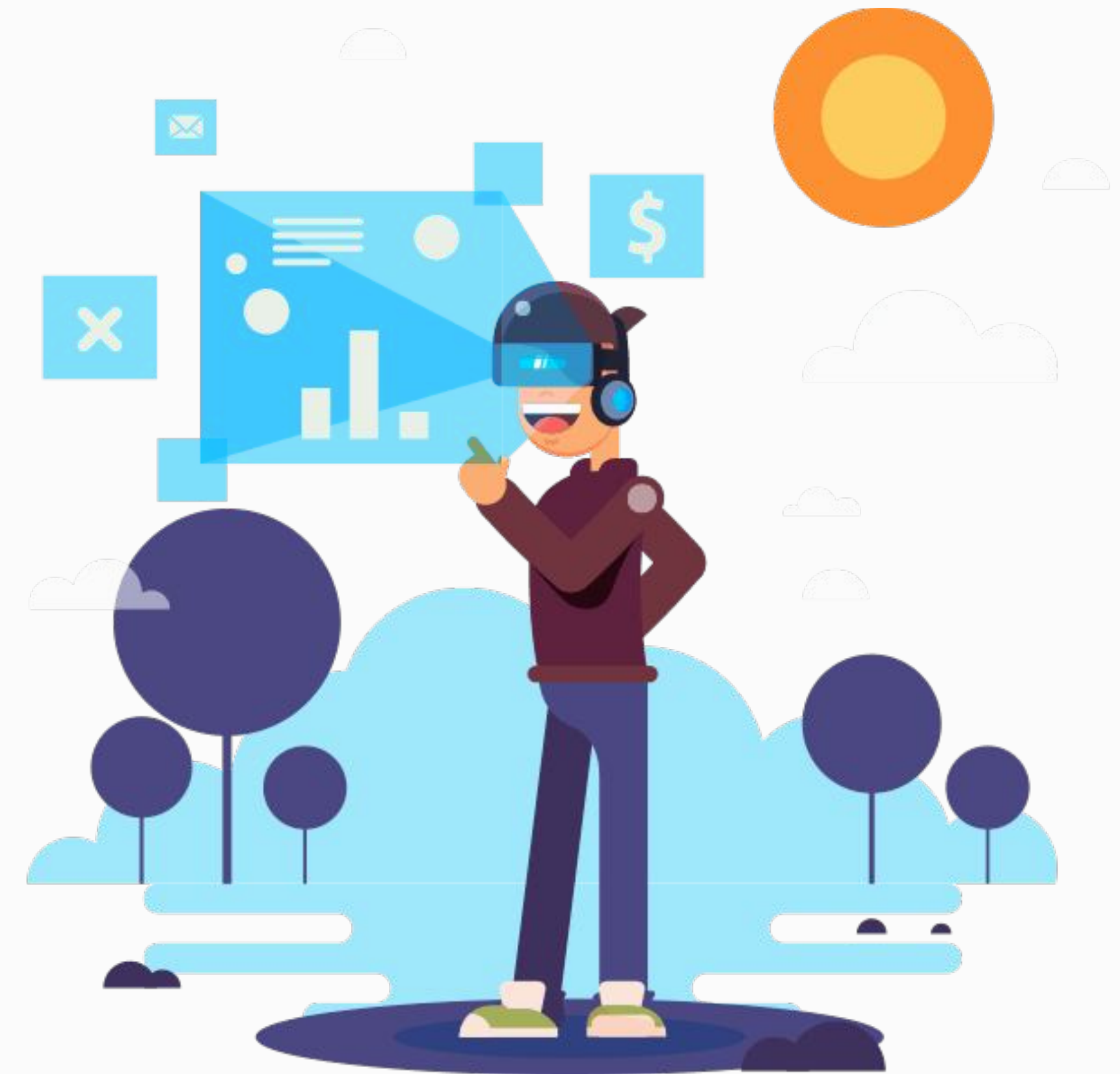
- Hard-to-read paper manuals that are difficult to follow.
- Reliance on text and 2D diagrams that don't adequately guide the assembly process.
- Confusing assembly steps that lead to errors, time wastage, and dissatisfaction with the product.
- Frequent trial and error due to complex instructions, increasing frustration and reducing product satisfaction.



Why Augmented Reality (AR)?

Augmented Reality (AR) is becoming crucial across various industries, offering simulations of real-world scenarios. Benefits include:

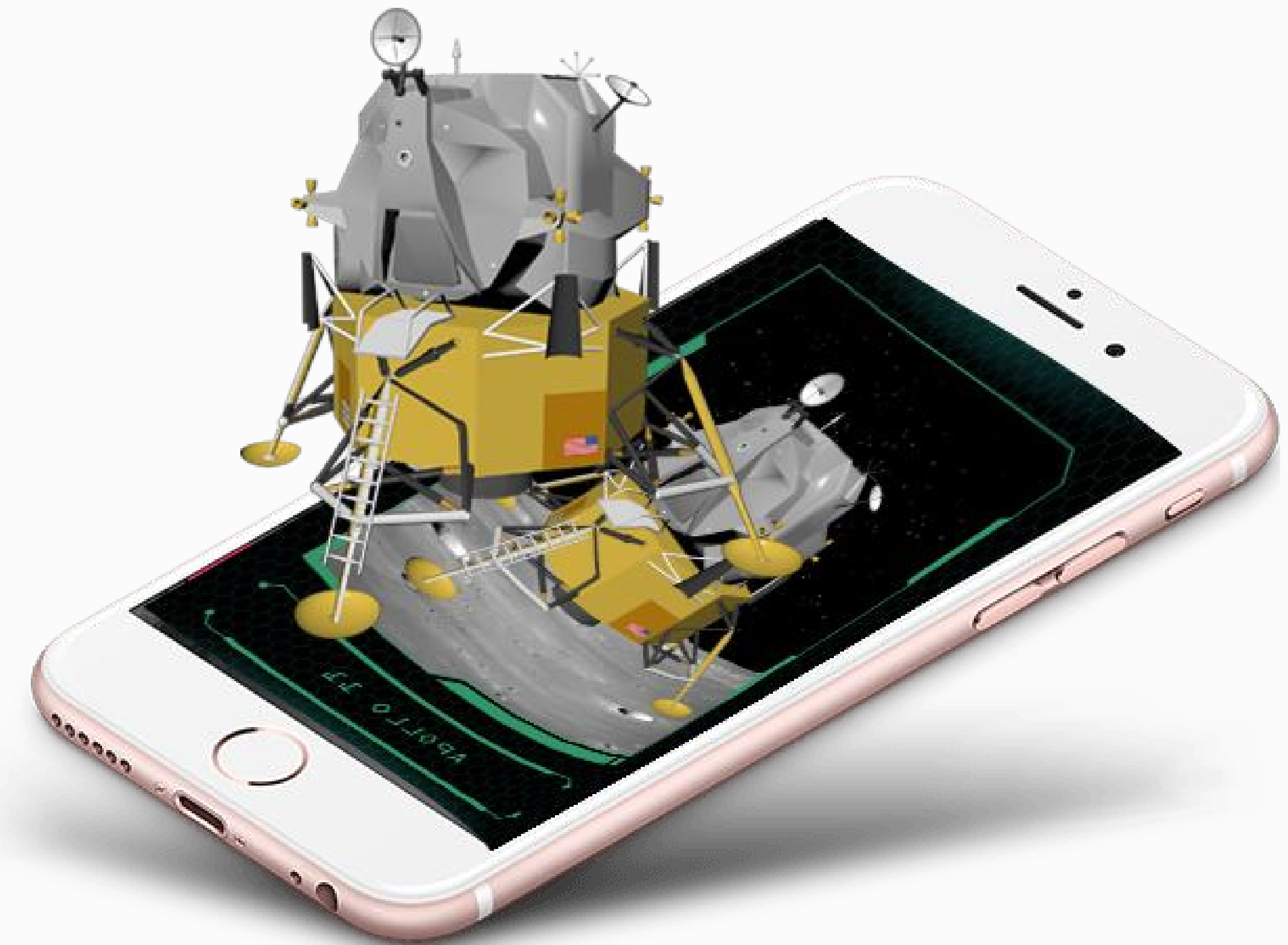
- Risk-Free, Cost-Effective Hands-On Experiences.
- Immersive And Interactive User Experiences.
- Enhanced Decision-Making, Design Reviews, And Problem-Solving.
- Growing Use In Handheld Devices.



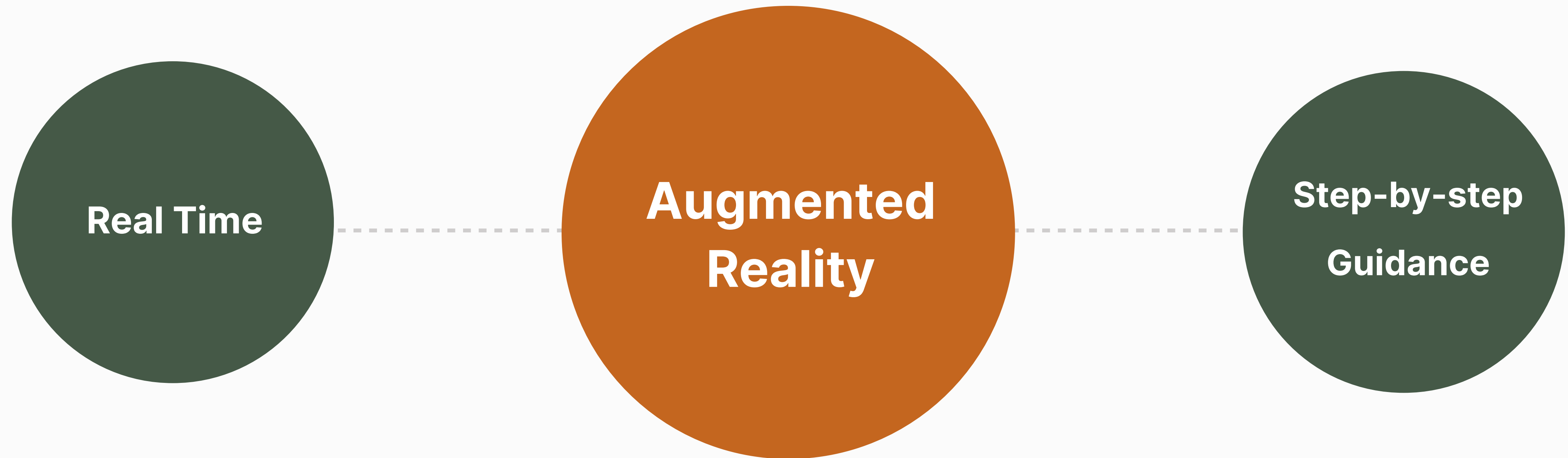
Why Mobile Phone?

We chose augmented reality (AR) on smartphone for several reasons. Phones are portable, enabling AR experiences on the go. Modern smartphones have essential AR sensors like accelerometers, gyroscopes, GPS, and cameras, which allow real-time tracking of position and orientation.

Additionally, the built-in cameras make AR interactions more intuitive and immersive. Since users can directly download AR apps, smartphones offer a more accessible platform for AR adoption.



Proposed Solution



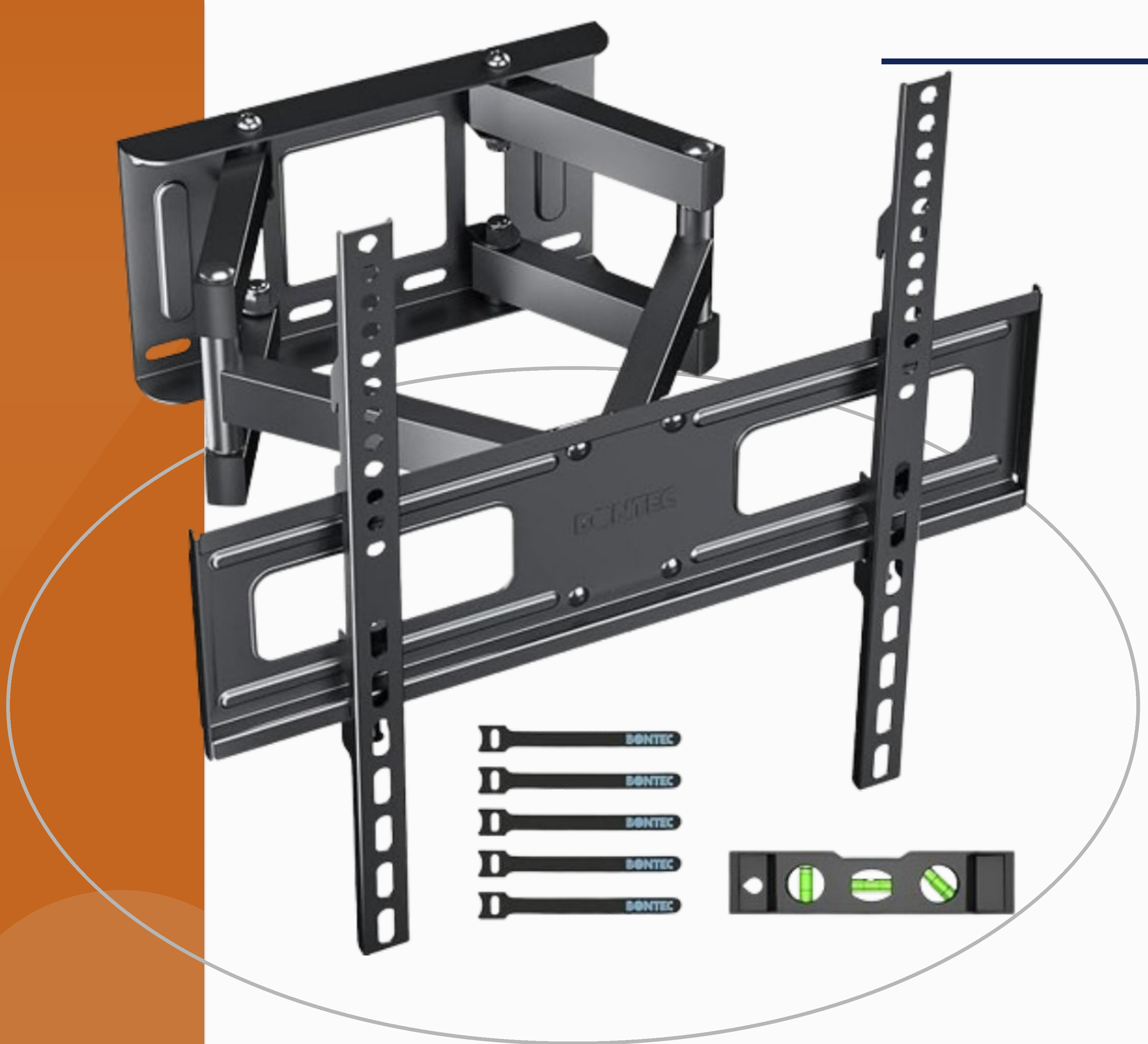
Empathise

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User research

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User survey

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Empathy map

—
Comprtitive analysis



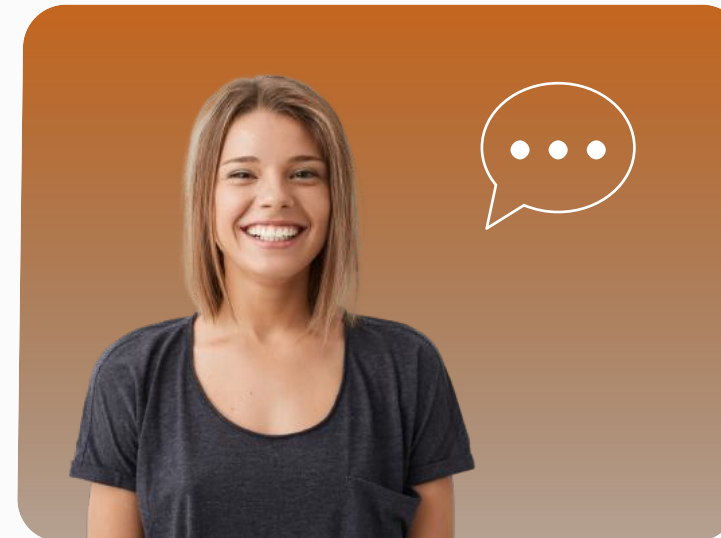
Empathize - User Research- Interview

Have you used any application which used AR technology? If yes, How was your experience?

Not at all, It will be a first experience for me

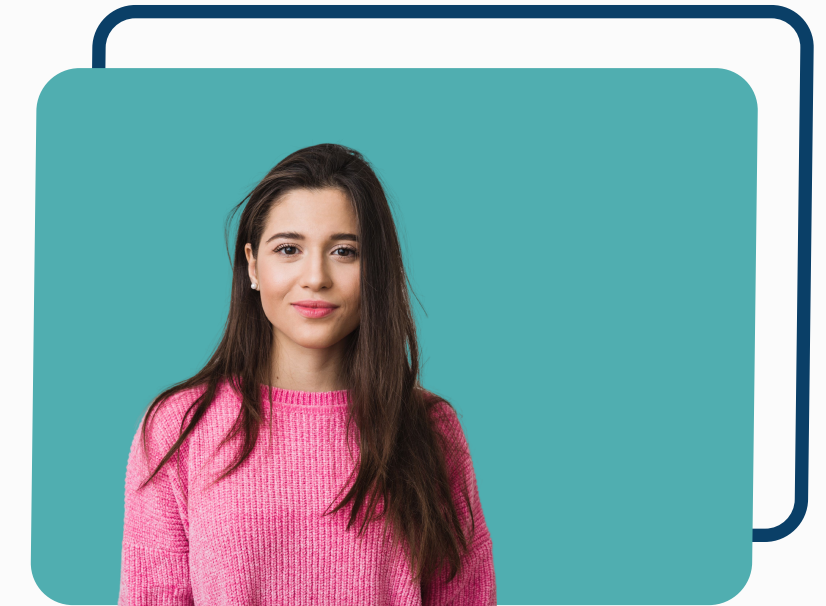
What challenges have you faced during assembling?

some products have many small pieces. or many different parts and in manual there are lots of illustrations which is confusing.



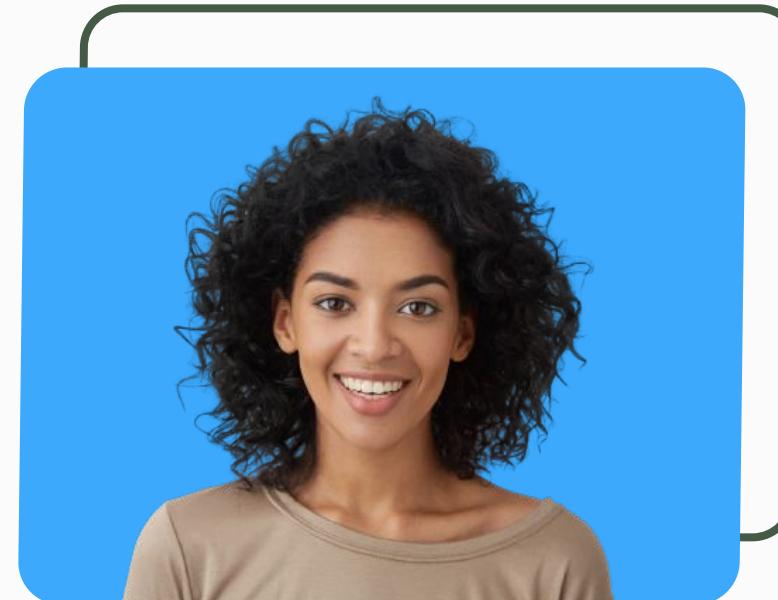
How do you normally assemble the products that need assembly? Have you ever used any other guidance to assemble products except the manual which comes with them?

I used their manual.
Yes, I used google to find some tutorial video.



What do you do when you face a problem during the assembling?

I read the manual again. I search for helpful videos. I ask for support from the company. In worst case I ask the company to send some one to assemble the product.



Do you like to use the manual or watching step by step guide while you are assembling a product? why?

Videos. I like to watch it than reading manual.

What do you do when you face a problem during the assembling?

Call someone professional or try to do it again and again with different ways.

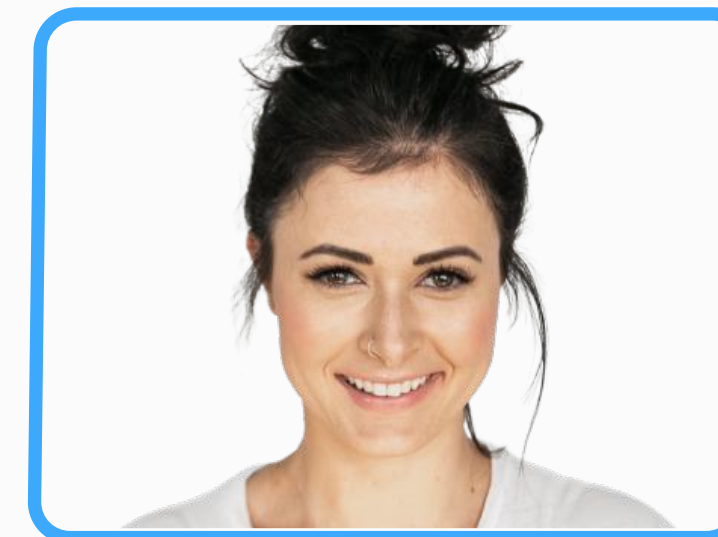


How do you normally assemble the products that need assembly? Have you ever used any other guidance to assemble products except the manual which comes with them?

I used manual / sometimes it is hard for me to assemble so I watch you tube videos.

Have you ever used any application for helping you to assemble products?

Not at all, It will be a first experience for me.

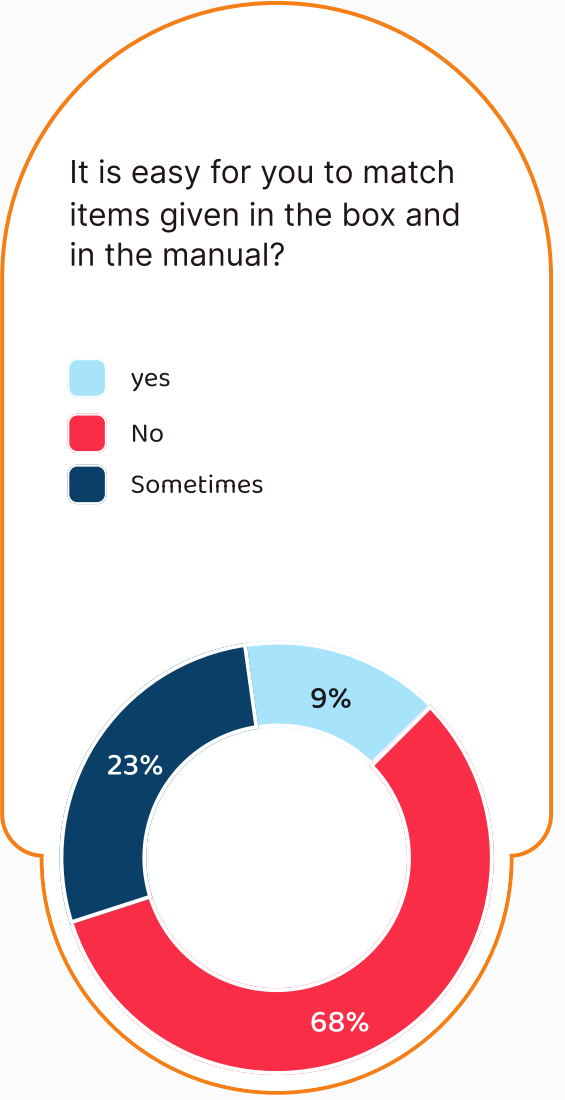
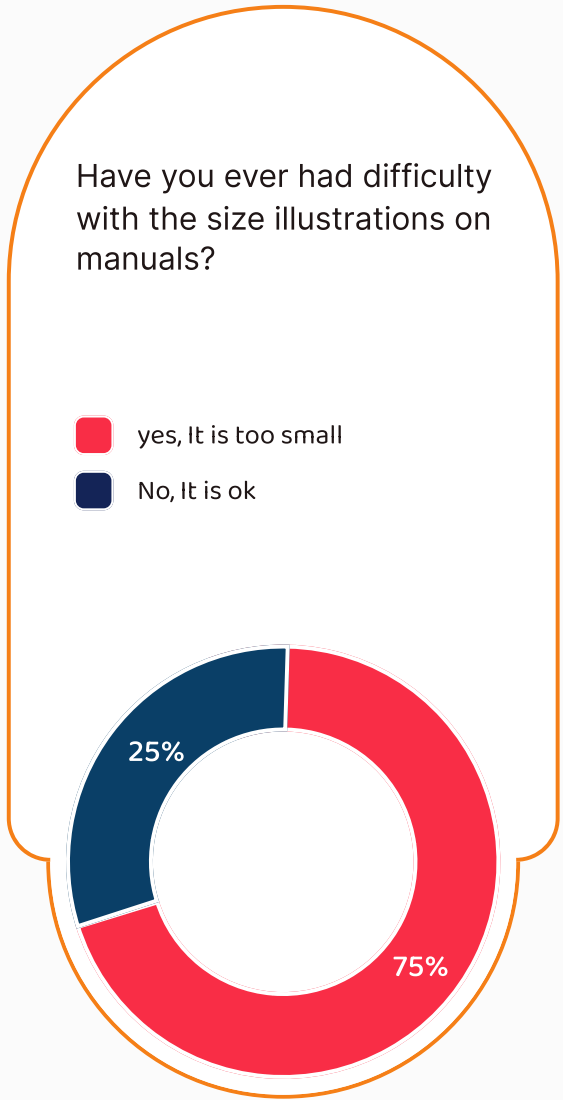
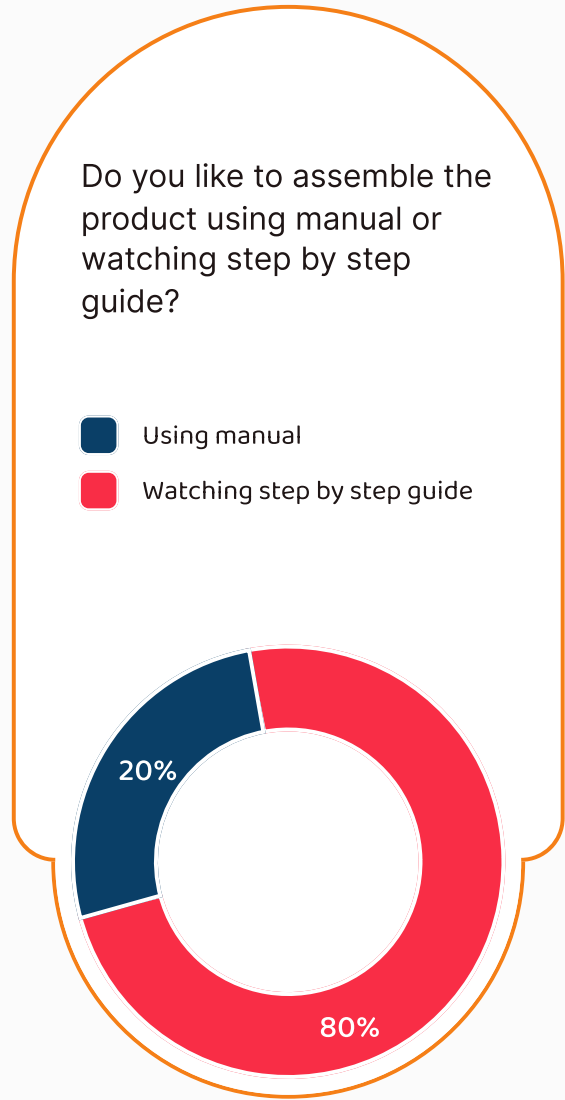
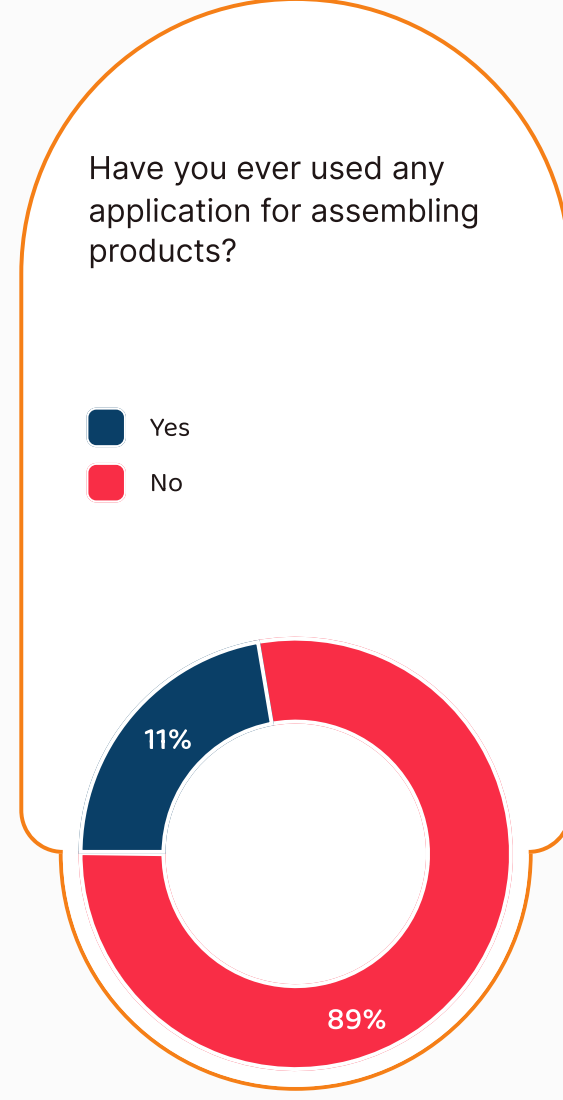
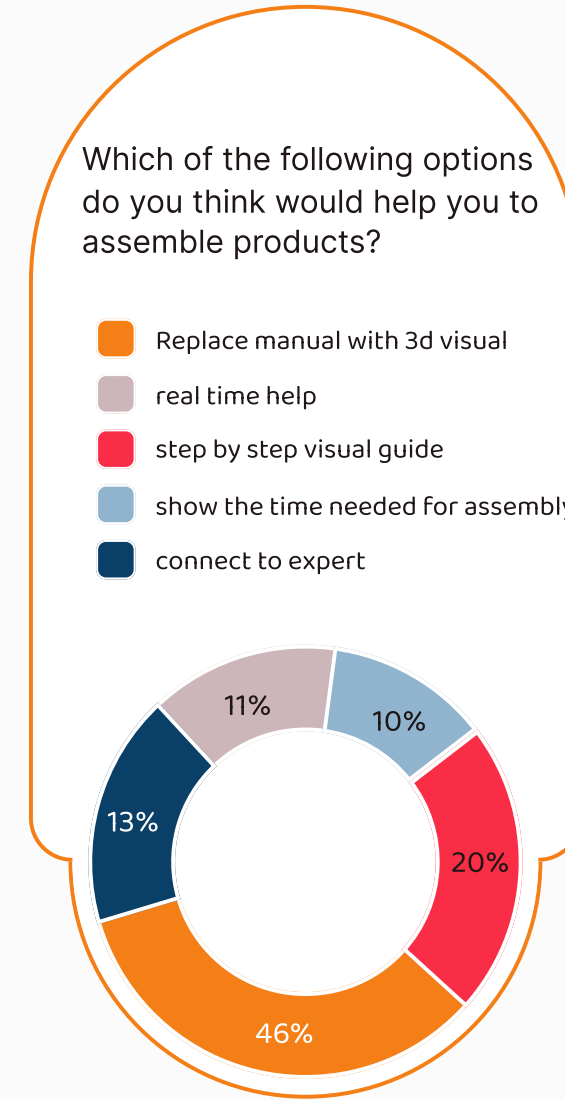
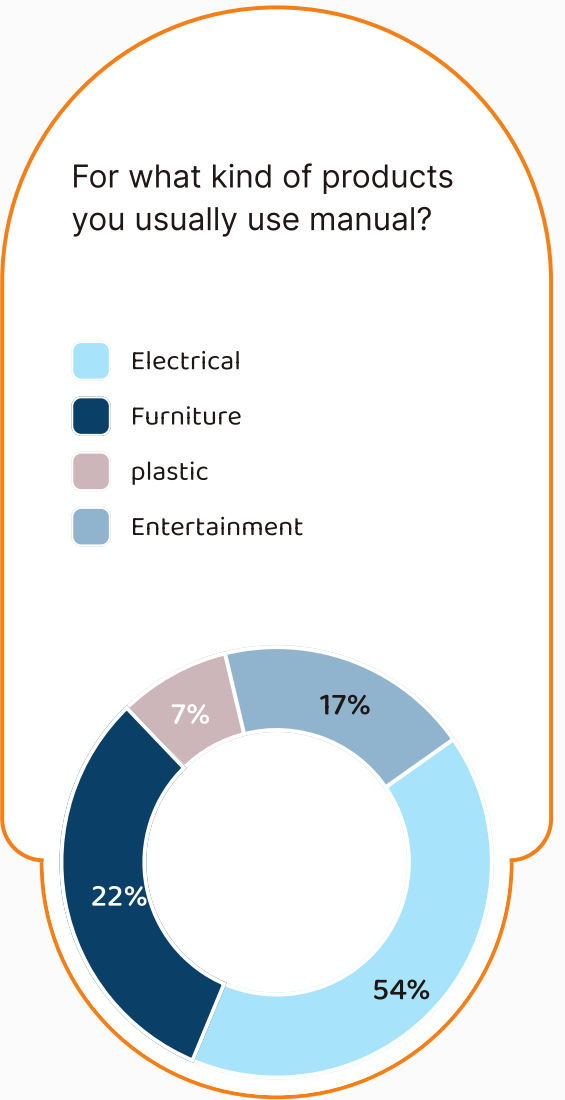
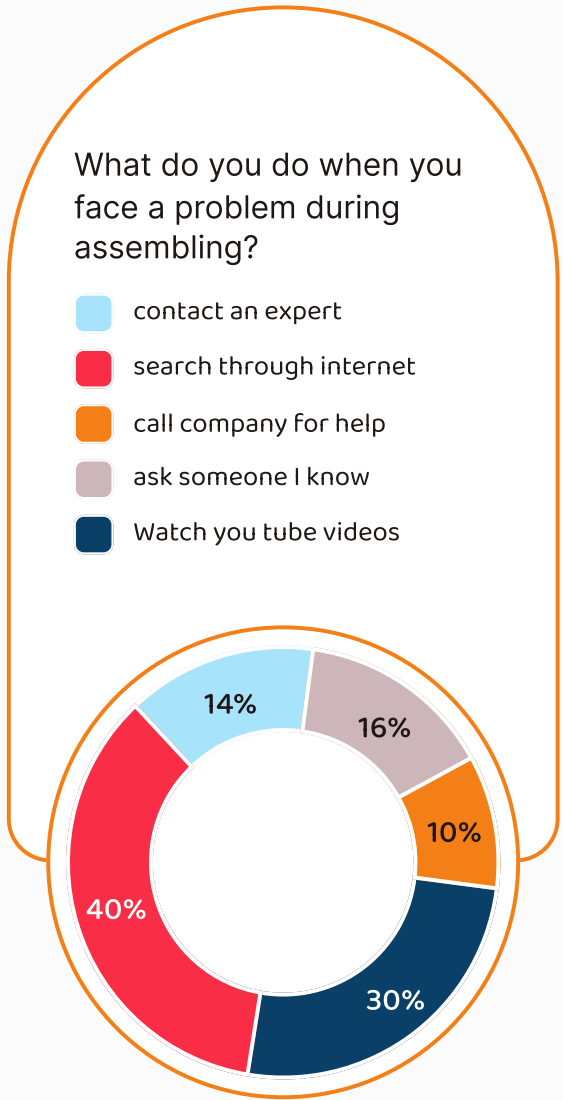
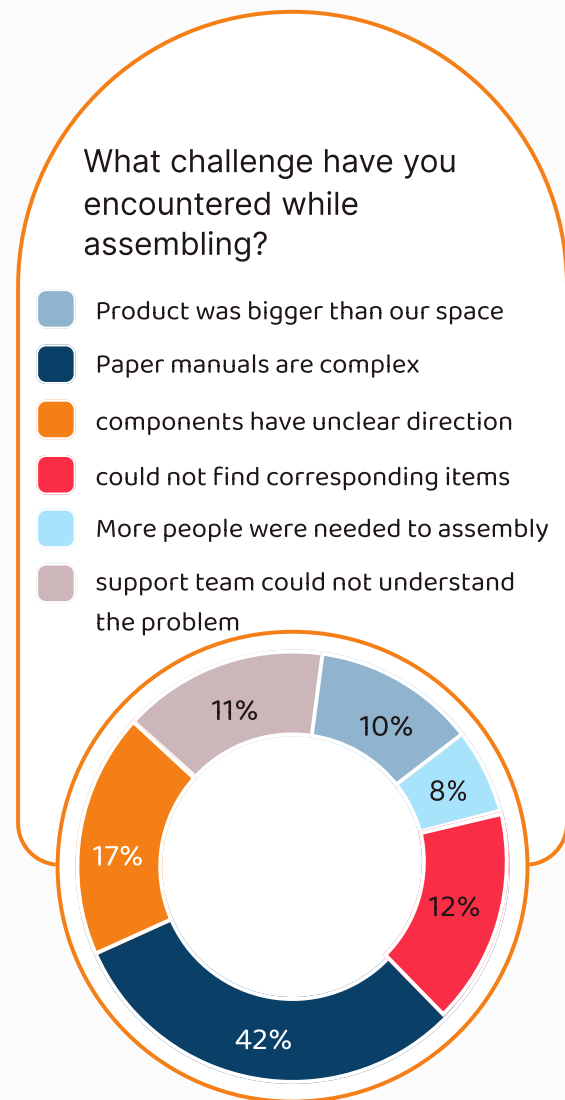
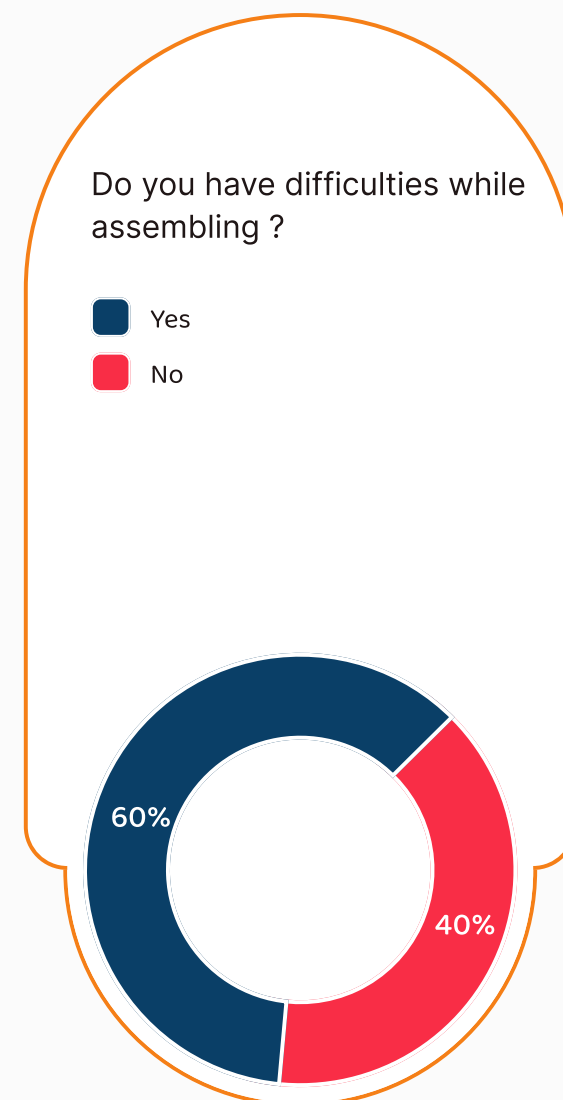
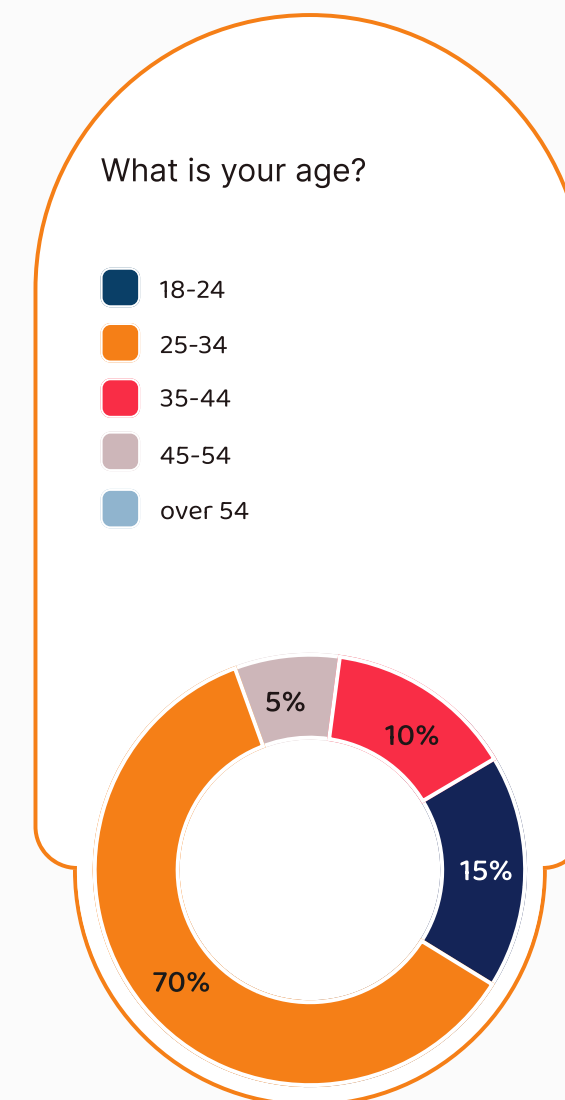


What challenges have you faced during assembling?

In manual the directions are not clear and it was difficult. In Ikea products it was written call us if you have problem but explaining my problem was way difficult than assembling as it wasn't a thing to explain on phone

Empathize - User Research- Questionnaire

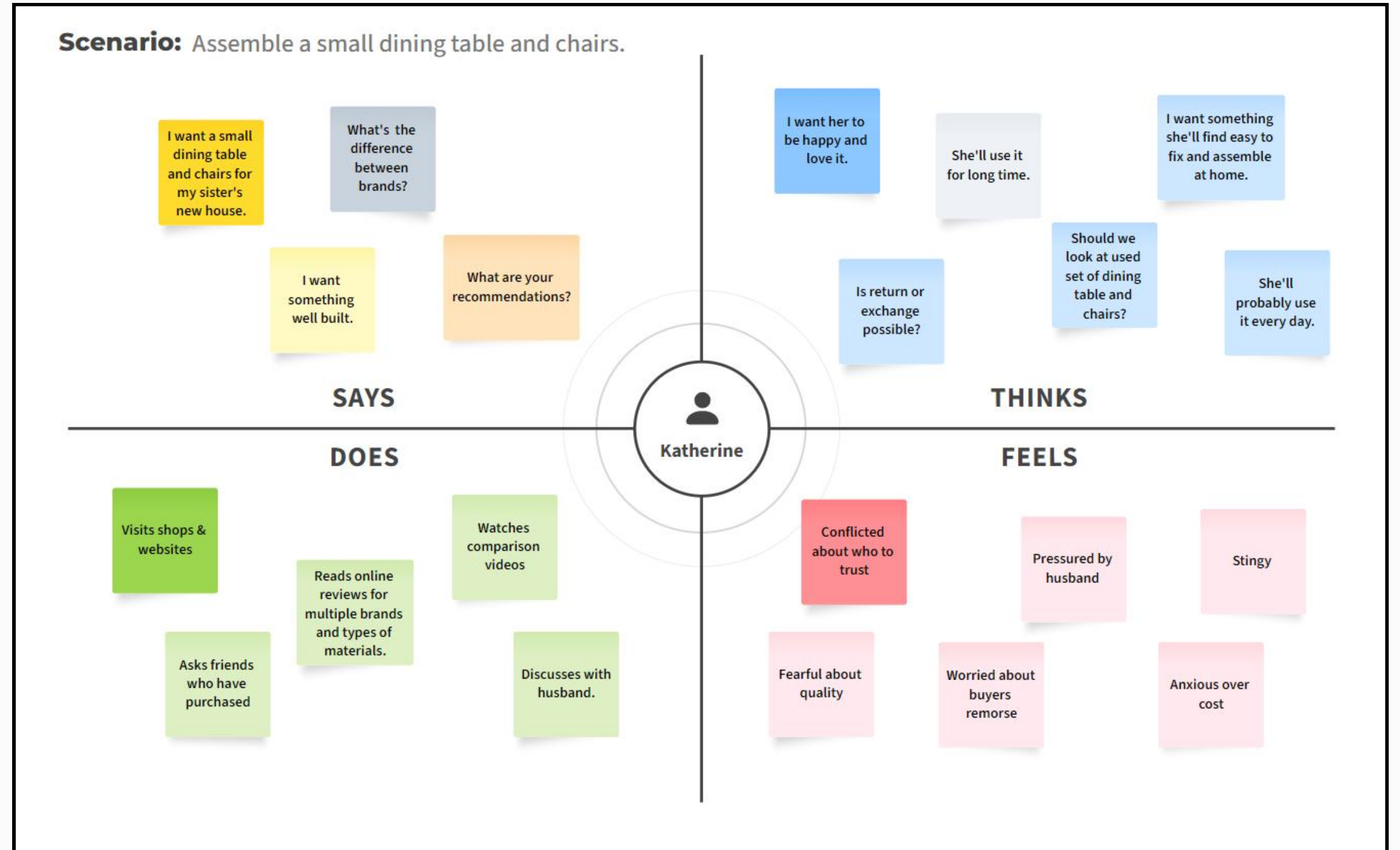
After conducting interviews, we created a questionnaire to uncover hidden user issues during the assembly process. 34 participants responded. This section summarizes the main survey questions and the percentage of user responses.



Empathy Map

User: Kathrine

Scenario: She wants to buy a dining table and chairs for her sister's new house but is concerned about whether her sister will like them, the cost, and whether she can assemble them easily.



Competitive Analysis

“IKEA” is Our head to head Rival.

Ikea is 3D application designed to have a look at the interior design products before someone purchase it. This app includes true-to-scale models of everything from sofas and armchairs to footstools and coffee tables.

Positives

- Text style onboarding
- 3D images are quite accurate convey the real life sizes
- Limited functionality makes it easier to use

Nagetives

- Doesn't offer product assembling
- No option to measure user's space
- App limited to IKEA products



Define

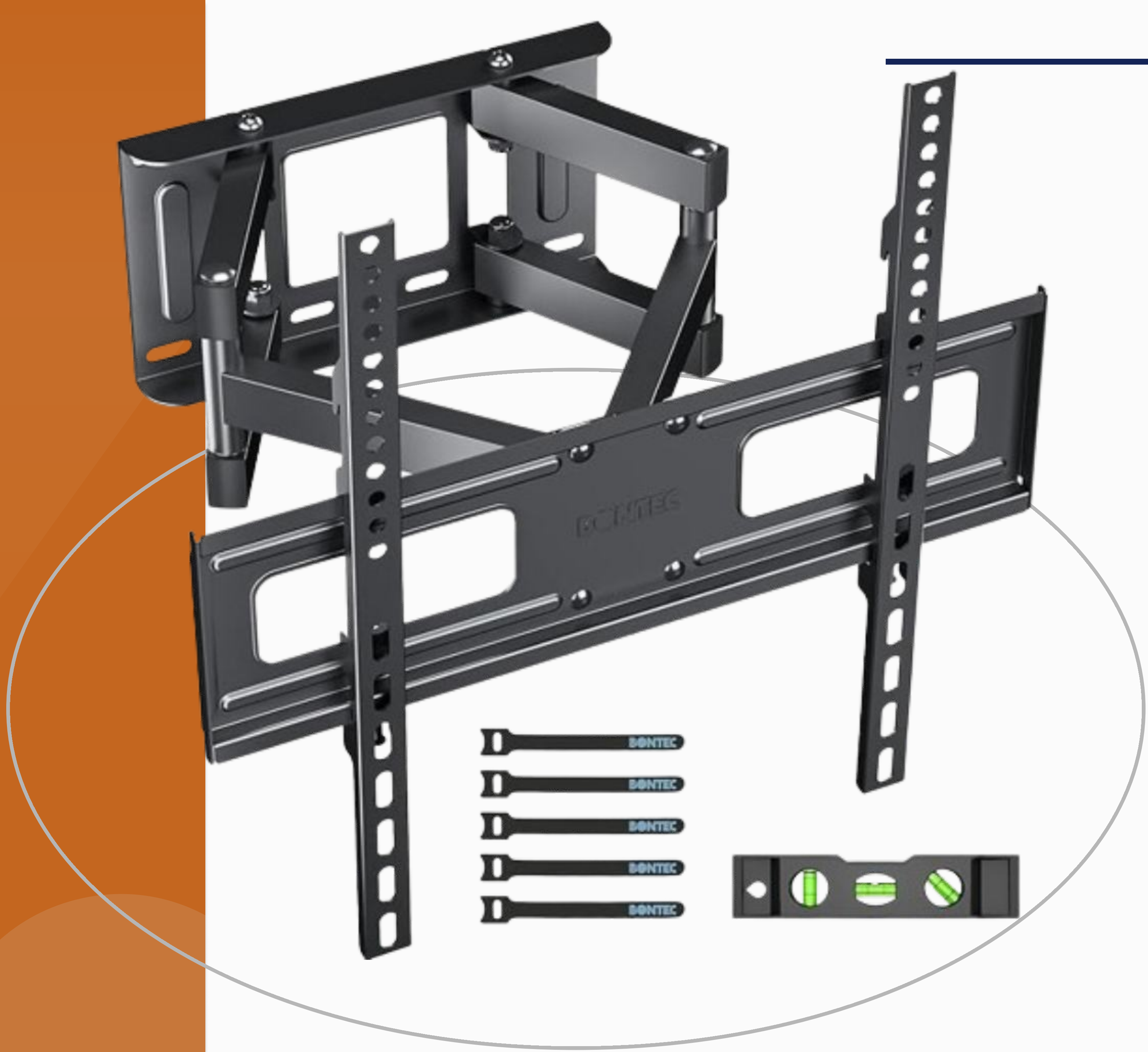
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User persona

—
User scenario

—
Information architecture

—
User flow

—
System design(HLA)



User Persona

Age: 31 years old Occupation: Nurse

Status: Single Location: Birmingham, UK

Goals

- Sam wants to know the estimated duration for the entire assembly process
- He wants to see more realistic visualisation rather than manual sketches
- He wants to know which part belongs to which step

Pain Points

- He does not know how long it takes to assemble. So, it affects his schedule
- He can not find a correct direction of the items
- He does not know if he could assemble by himself or need a second hand

Sam William



User Scenario

Sam, a 31-year-old nurse, recently moved into a one-bedroom, unfurnished apartment. Excited to make the space his own, he purchased a TV set. But as he started assembling it, he found himself overwhelmed with unidentified parts and confusing instructions. As he needed someone to help him to assemble the product he spent his whole day and he missed one shift at the hospital.

Thus, Sam downloaded an AR app, designed to assist with assembly tasks. Instead of staring at abstract PDF instructions, the app gave him a more interactive experience. He simply aimed his phone's camera at each component, and the app identified it, demonstrating exactly how and where it fit into the overall assembly. The app also provided a time estimate for completing the assembly, and if second hand is need.

Alexendra Sara James

User Persona

Age: 30 years old Occupation: Teacher

Status: Single Location: Barcelona, Spain

Goals

- She wants assemble with breaking product in to easy steps guidance
- She wants clear understandable guidance
- Alexendra wants to connect to an expert

Pain Points

- Complexity of manual assembling makes her overwhelming
- Poorly labelled or mismatched parts
- Do not know how to solve problem by alone while assembling

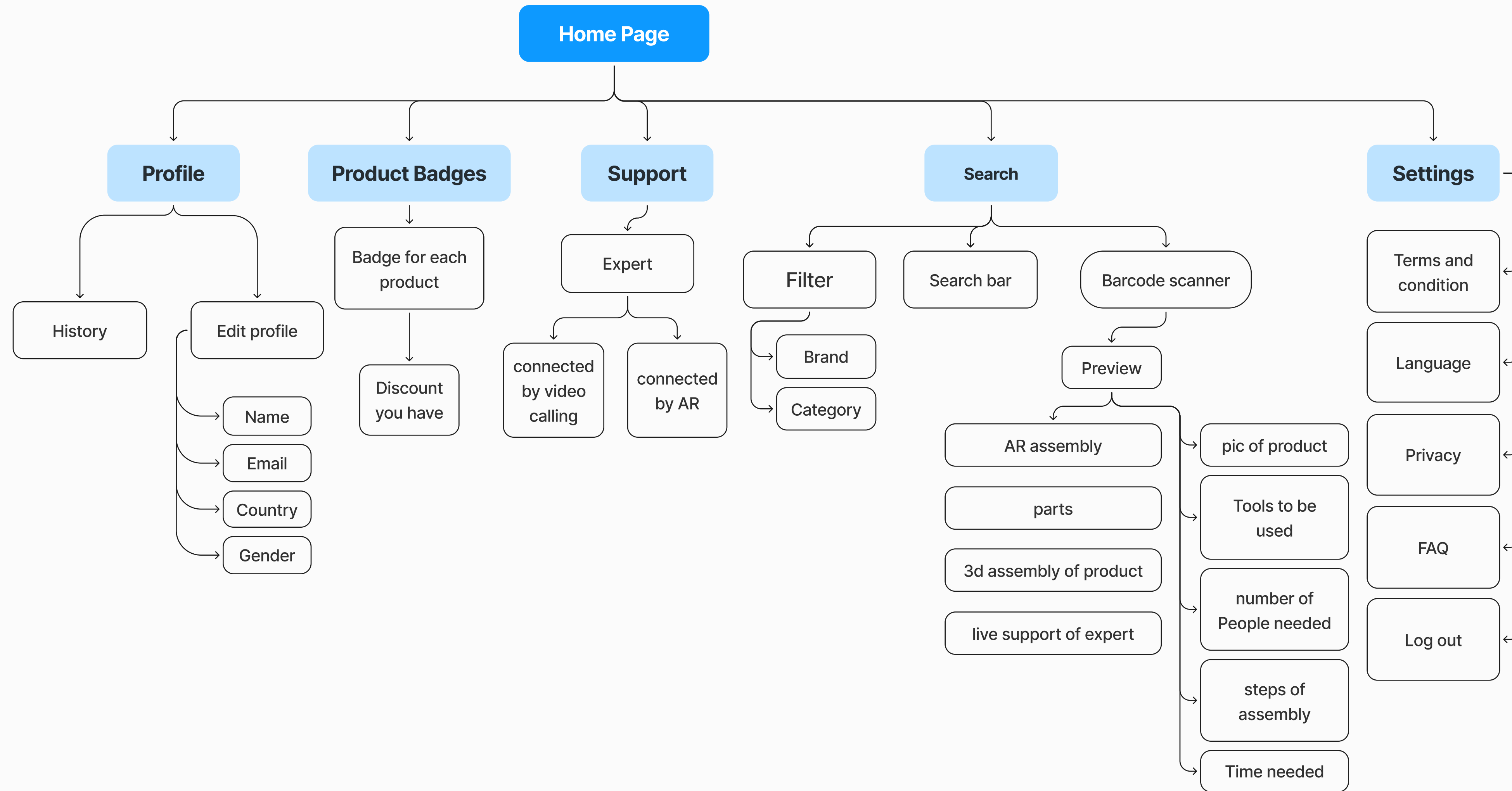


User Scenario

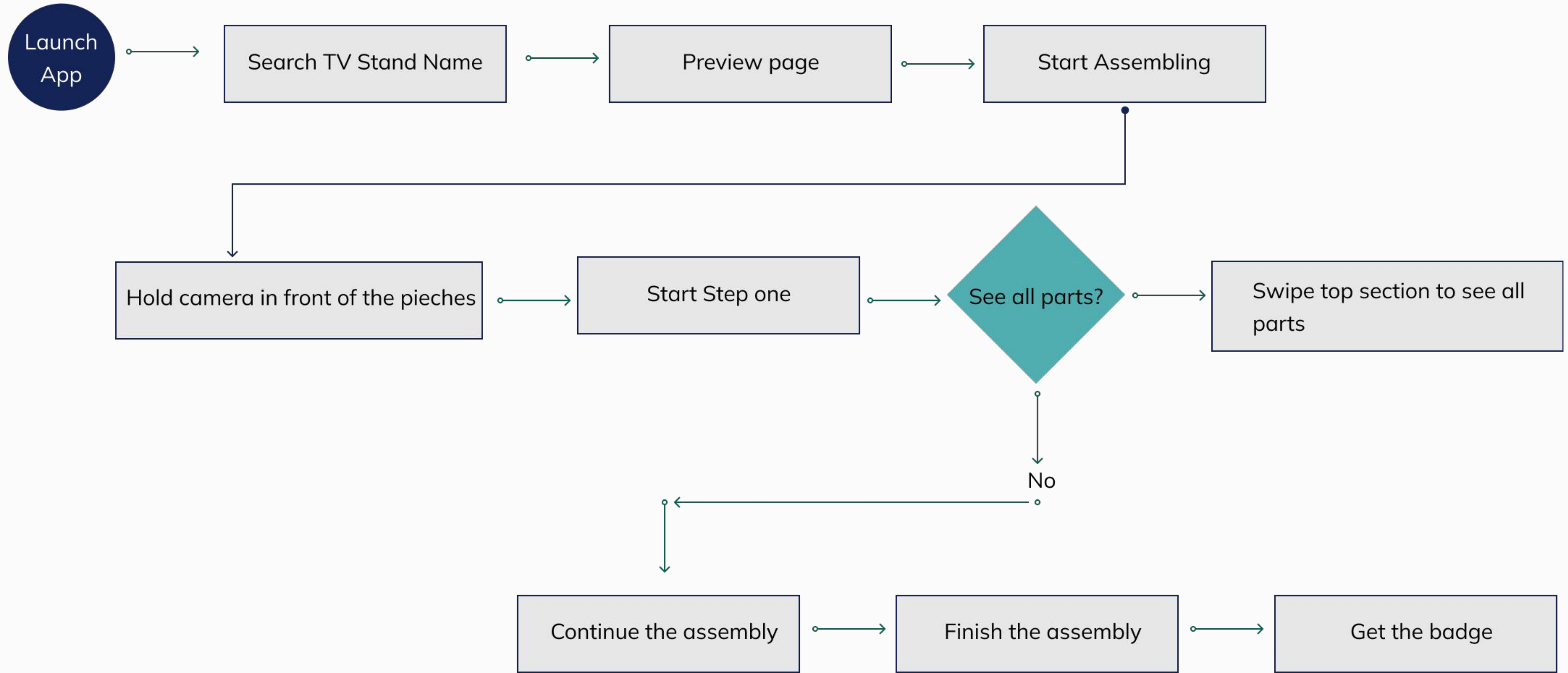
Sarah is a 30-year-old professional teacher who recently purchased a new TV stand for her home. She is excited to set it up and give her living room a fresh look.

However, she has had negative experiences in the past with assembling furniture, finding it to be a complex and frustrating task. She often struggles with poorly labeled or mismatched parts and feels overwhelmed by the instructions provided in the manual. The vast majority of the time, she is at confused for what to do when she is confronted with a difficulty while she is putting together a product. Thus, she decided to download an application to provide her clear and understandable guidance and she can connect to an expert anytime when she faced an issues.

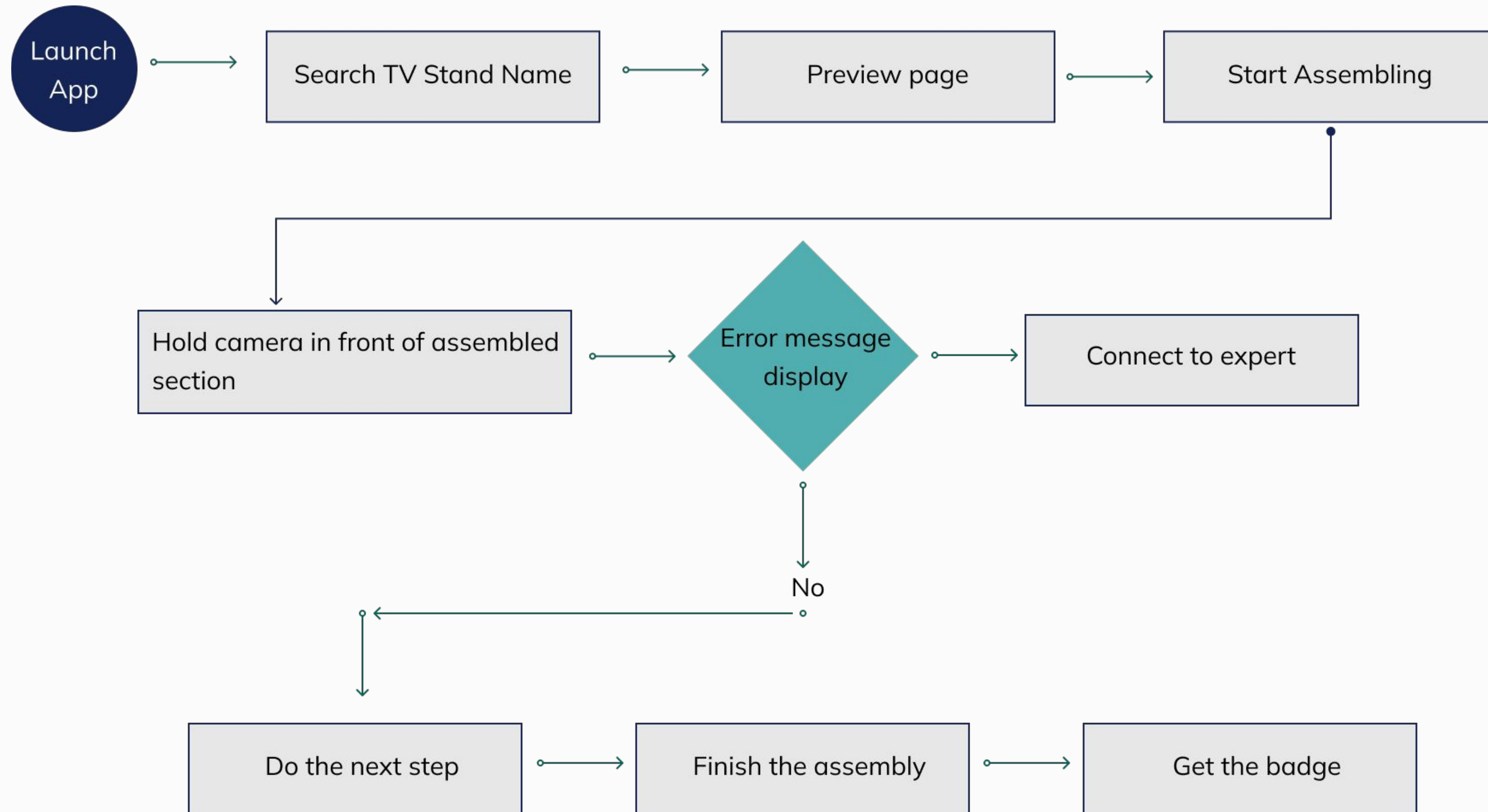
Information Architecture



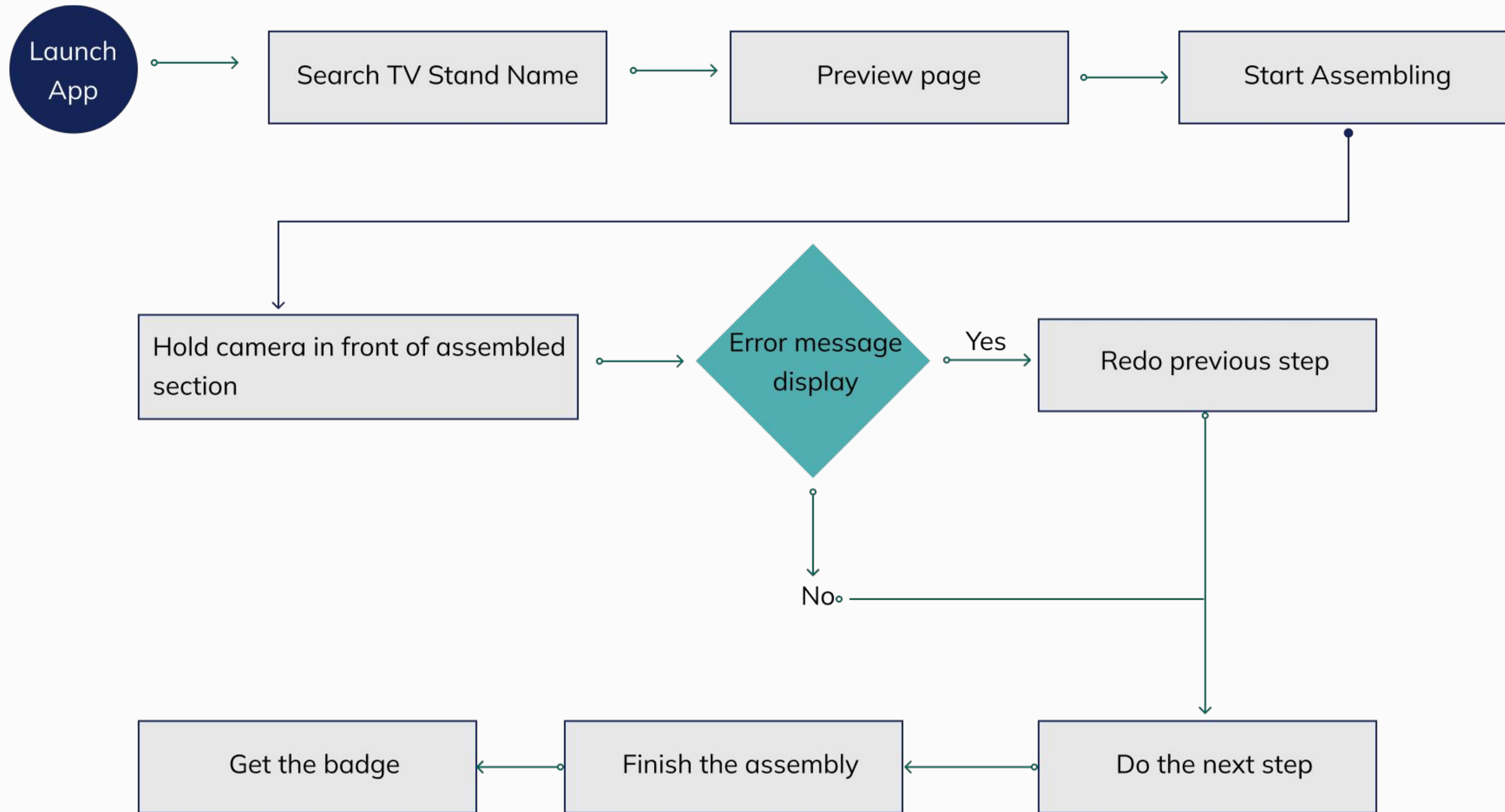
User Flow One



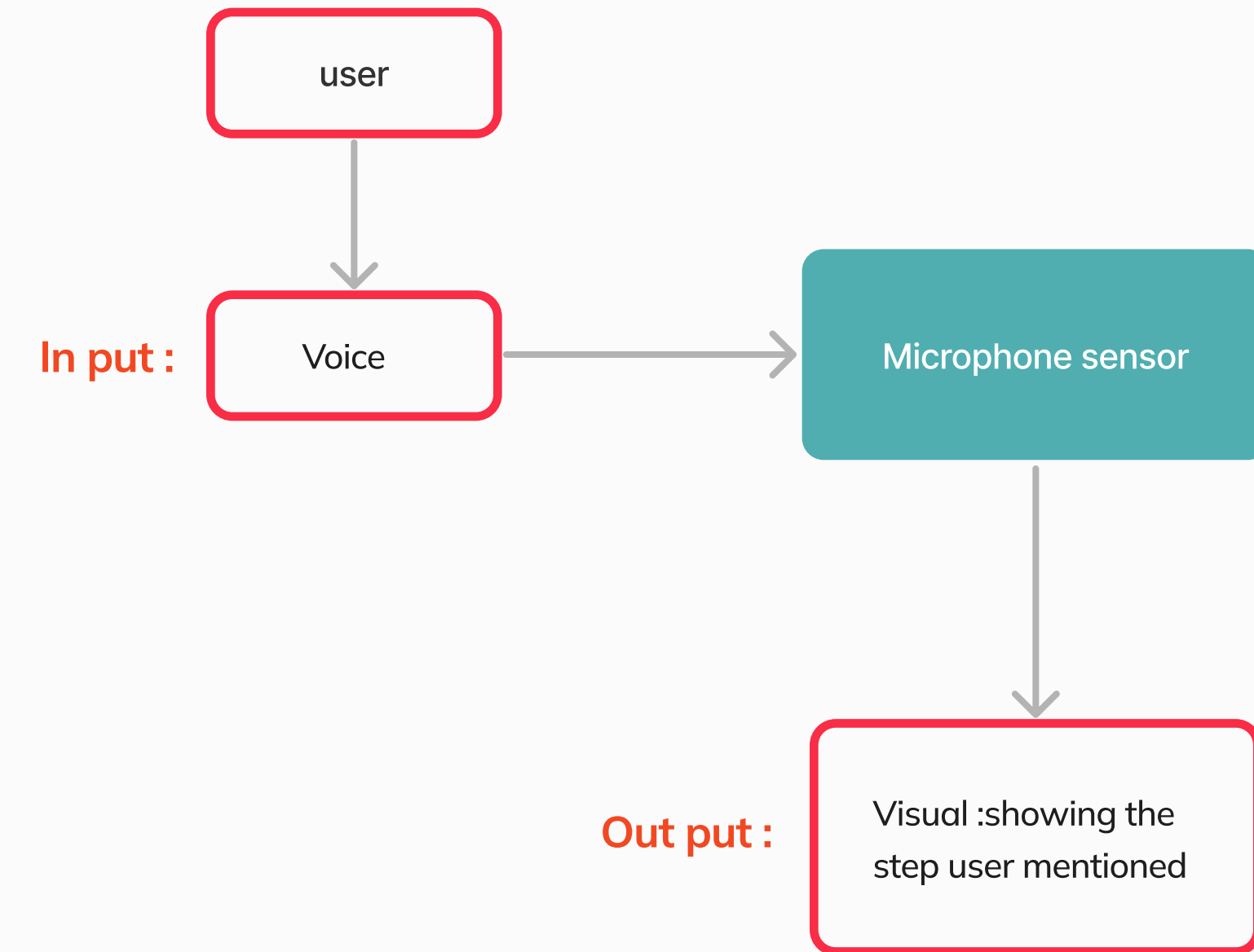
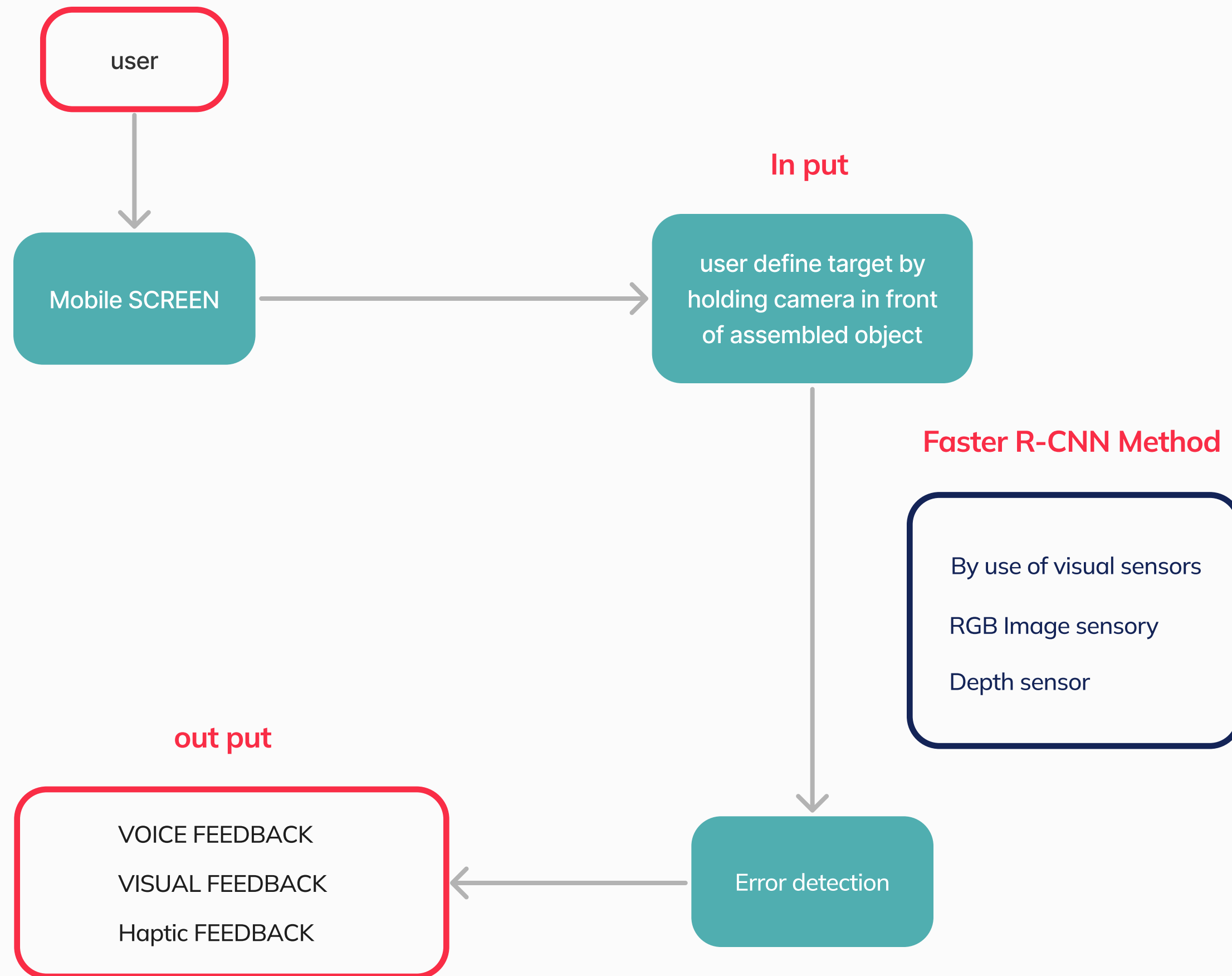
User Flow Two



User Flow Three



System Design (HLA)



Design

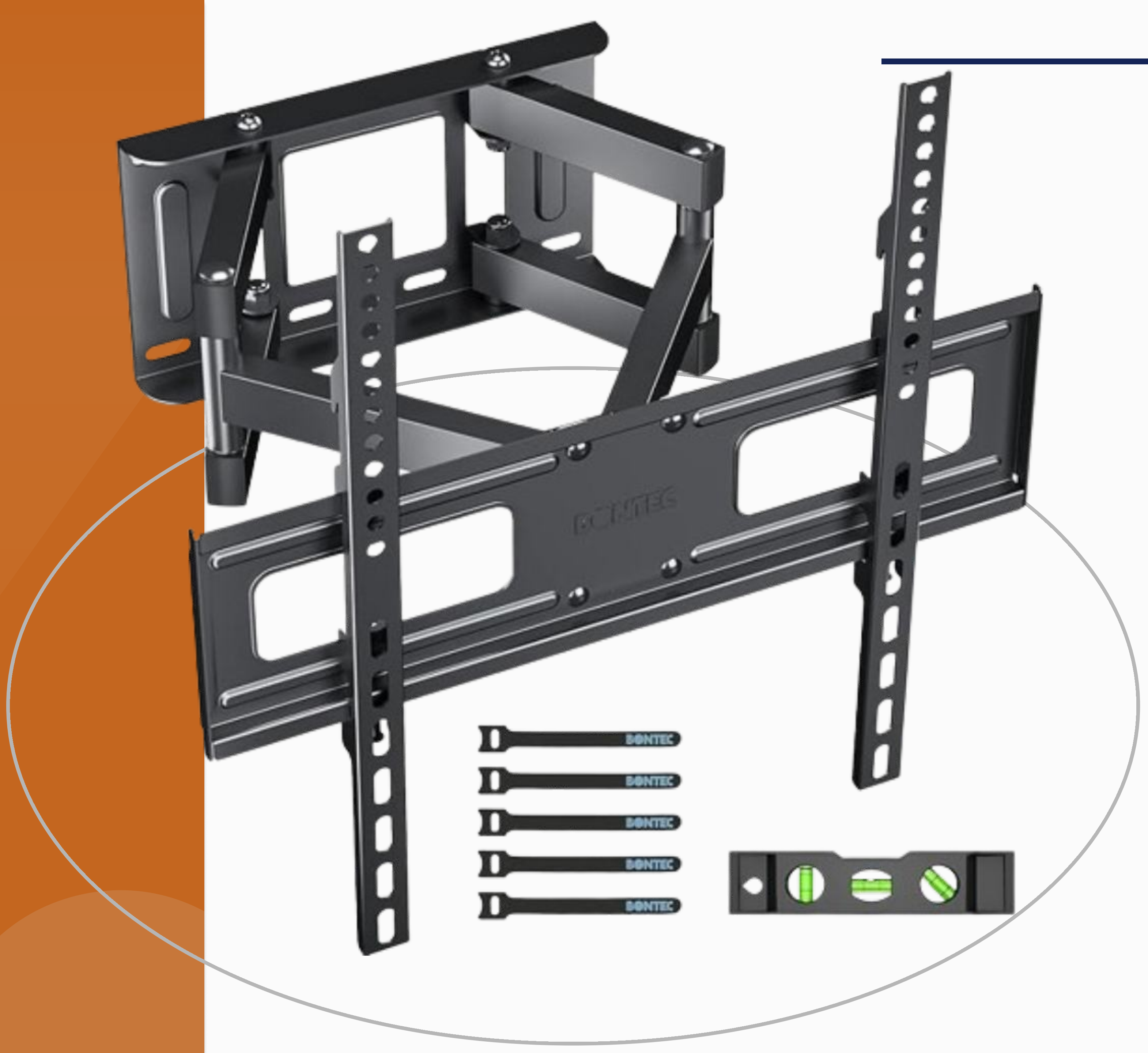
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Sketches

—
Lo-Fi

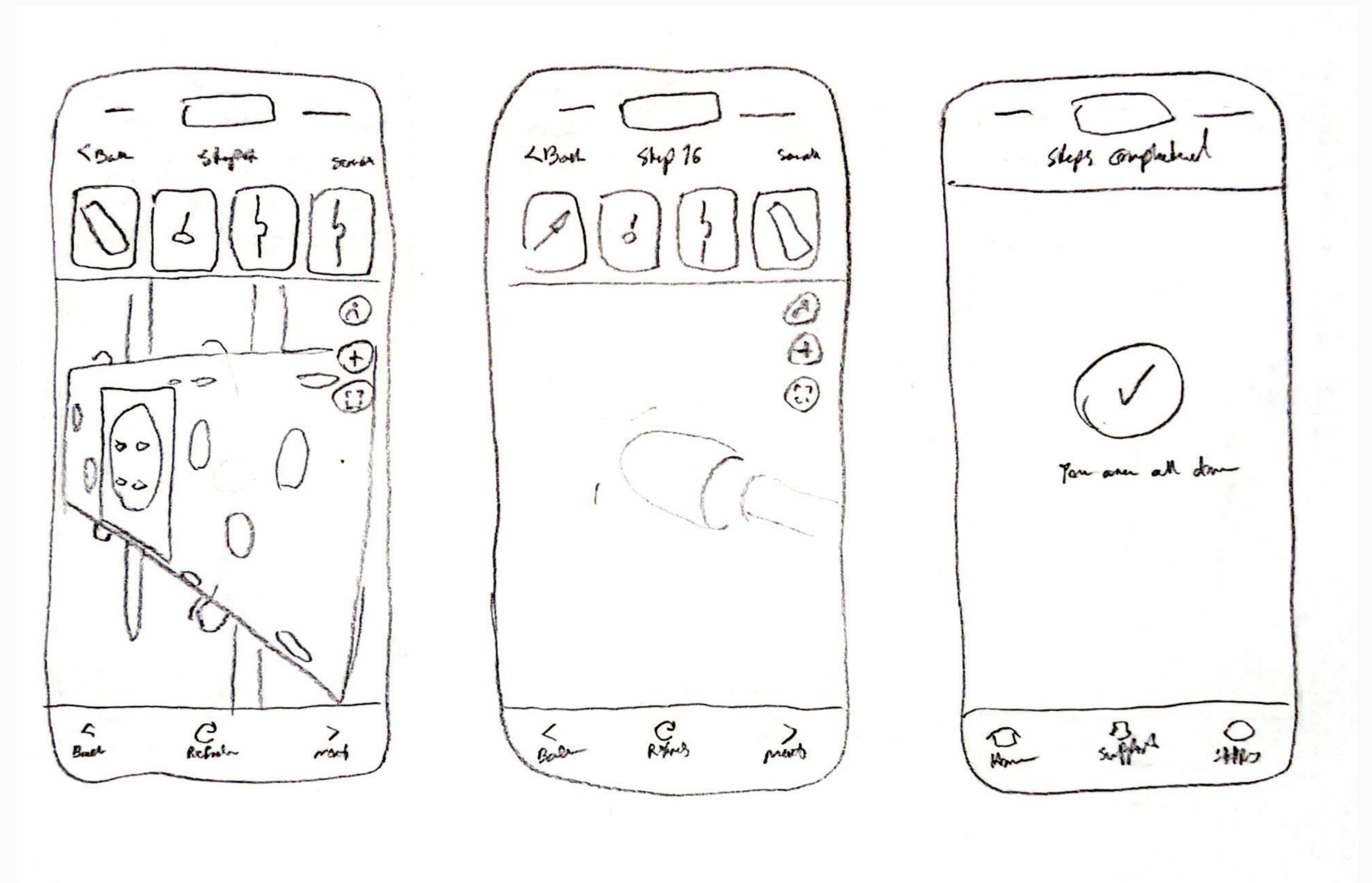
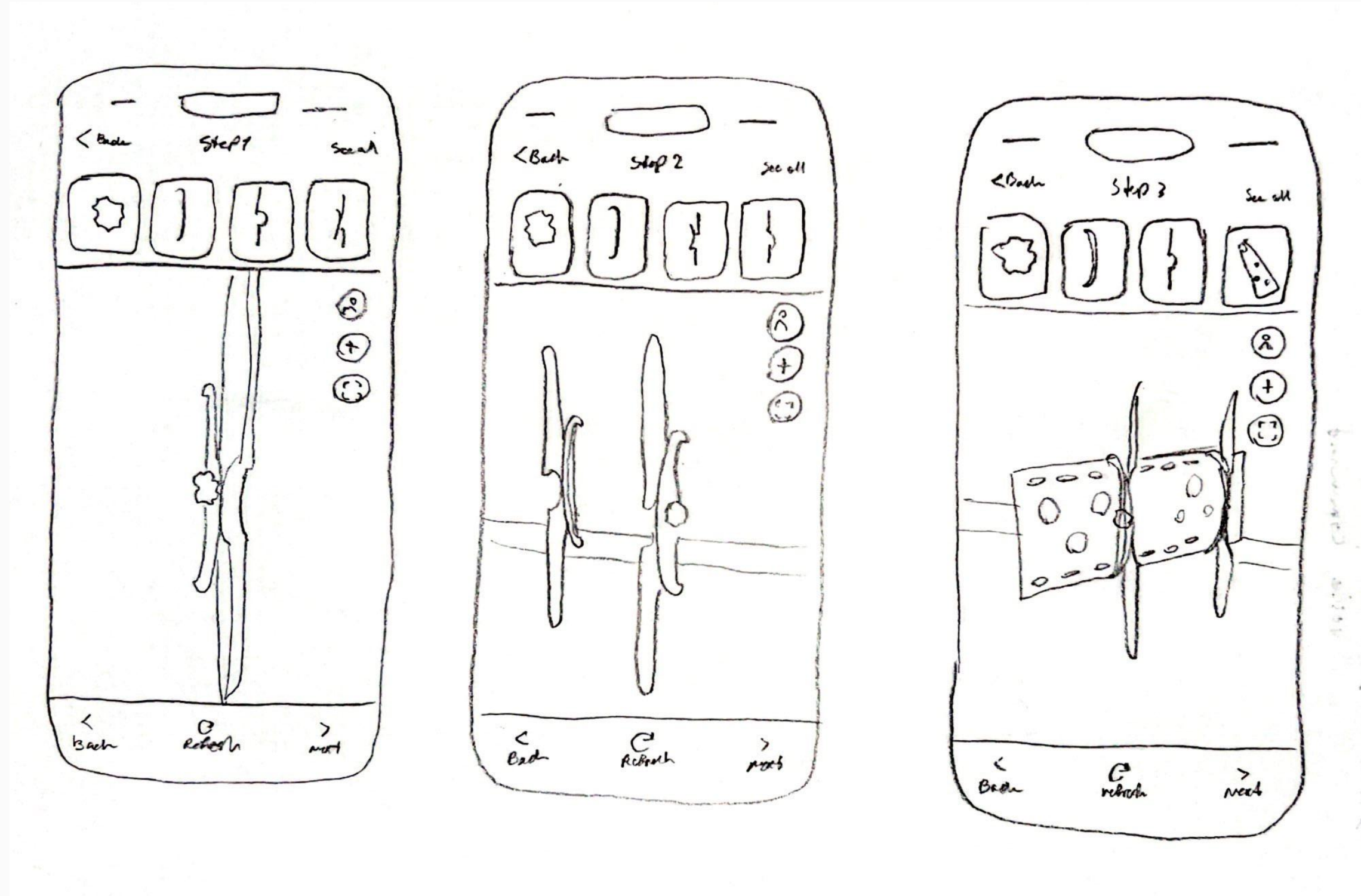
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Storyboard

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Hi-Fi

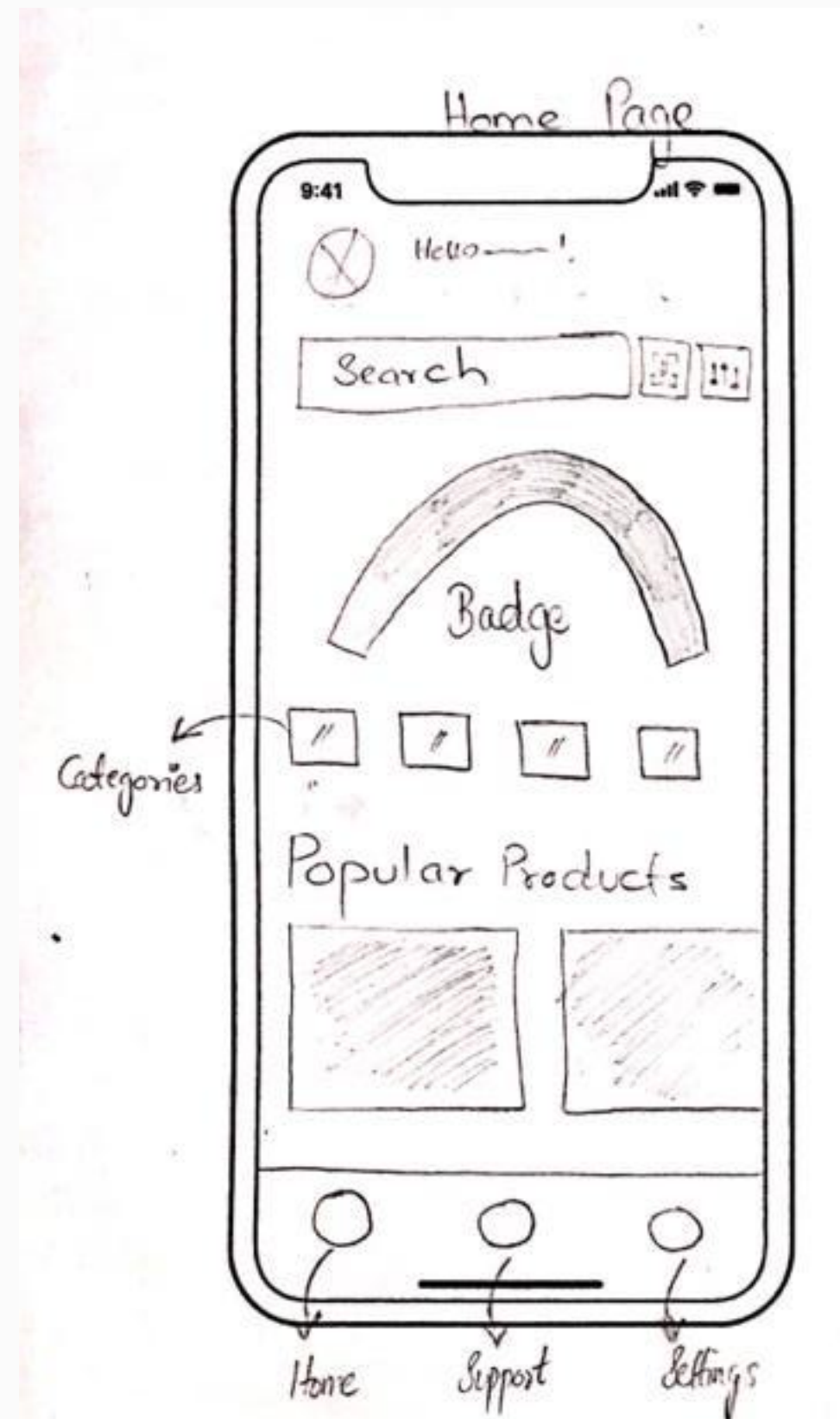
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Feature definition



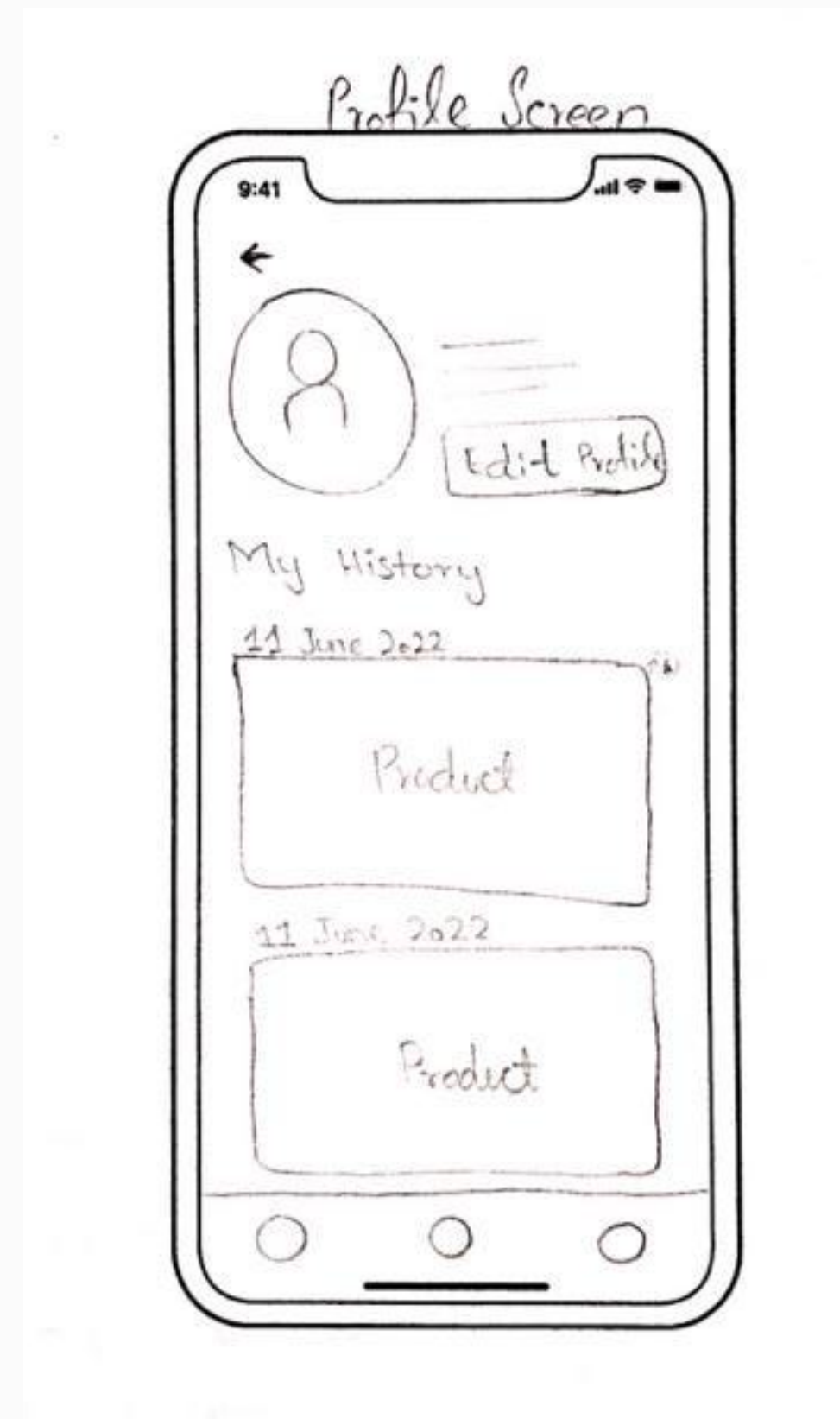
Sketches



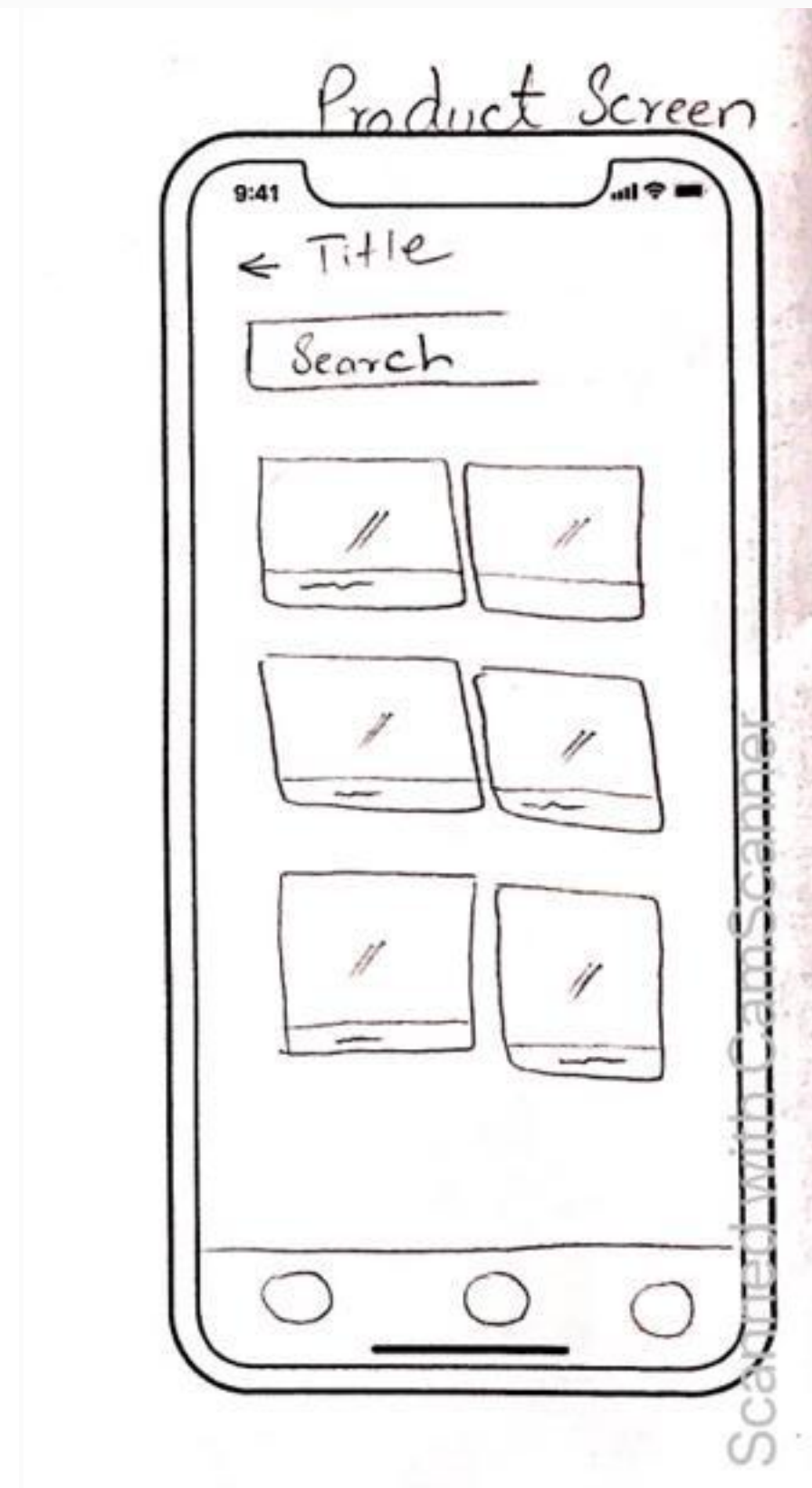
Sketches



Home



Profile

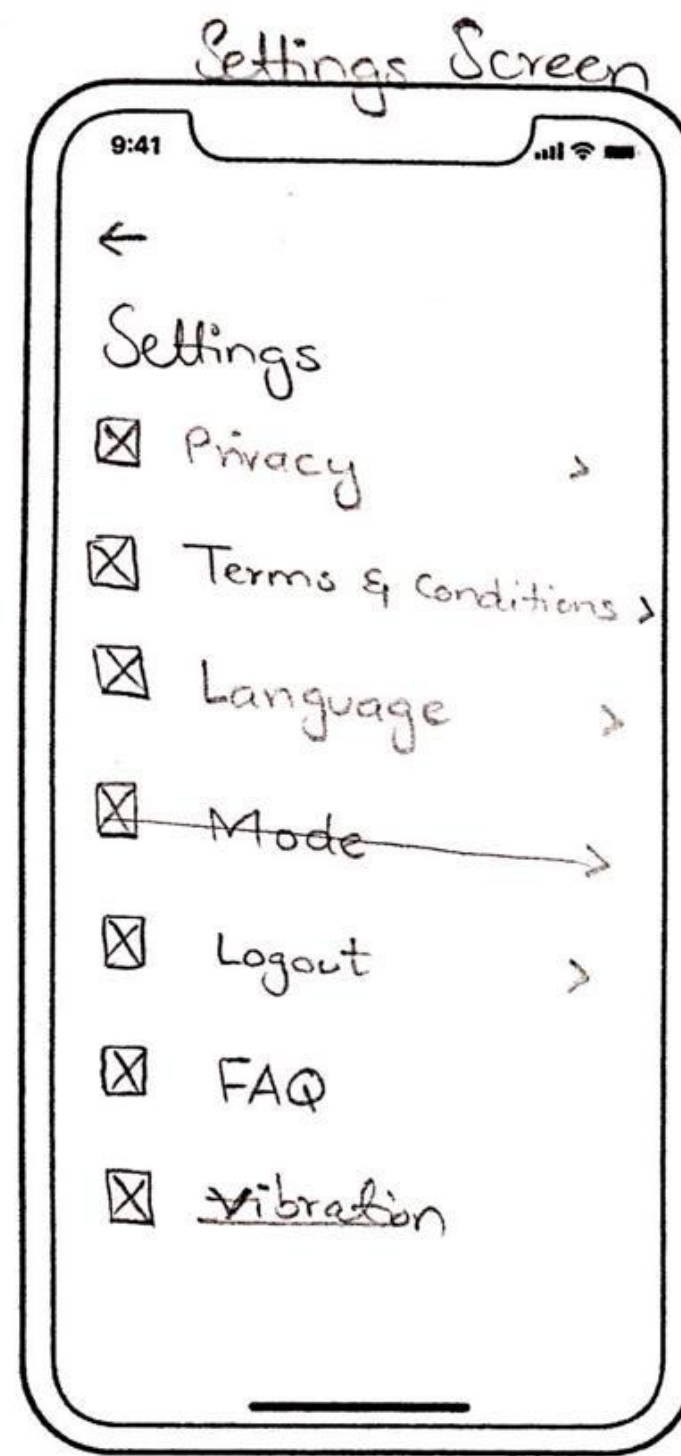


Product page

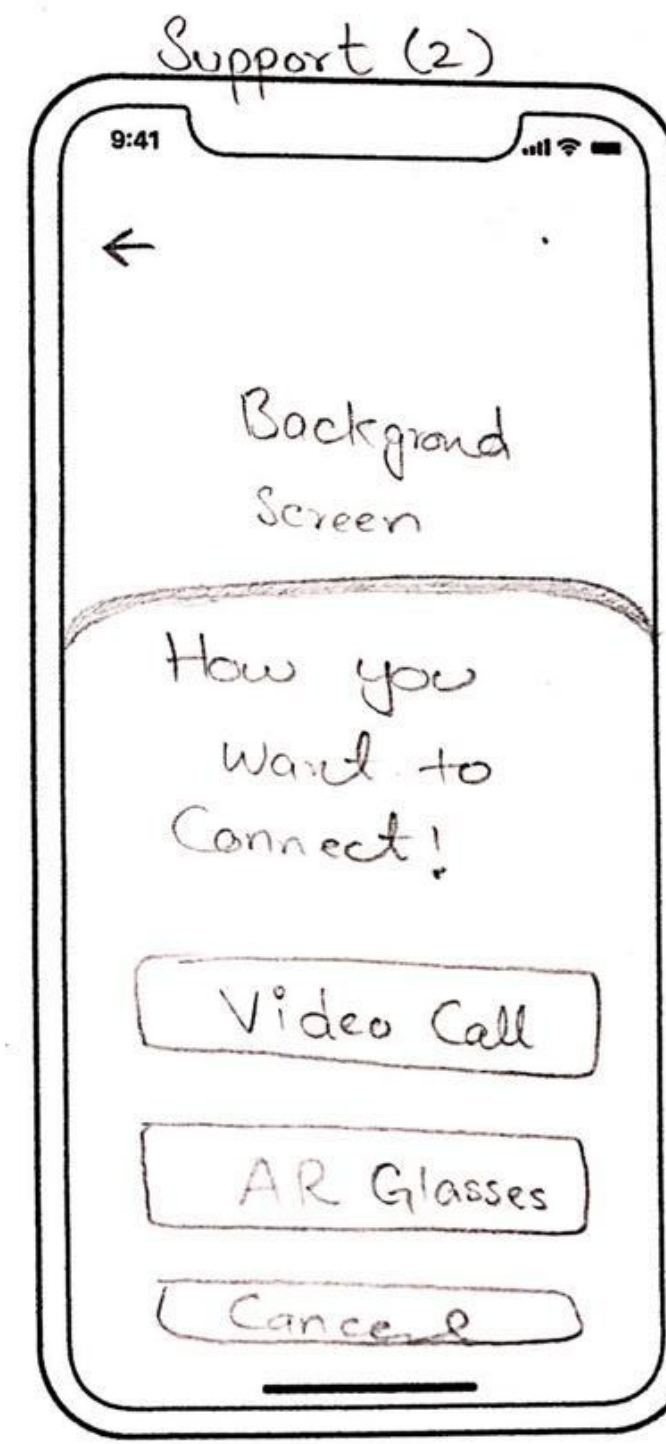


QR scan

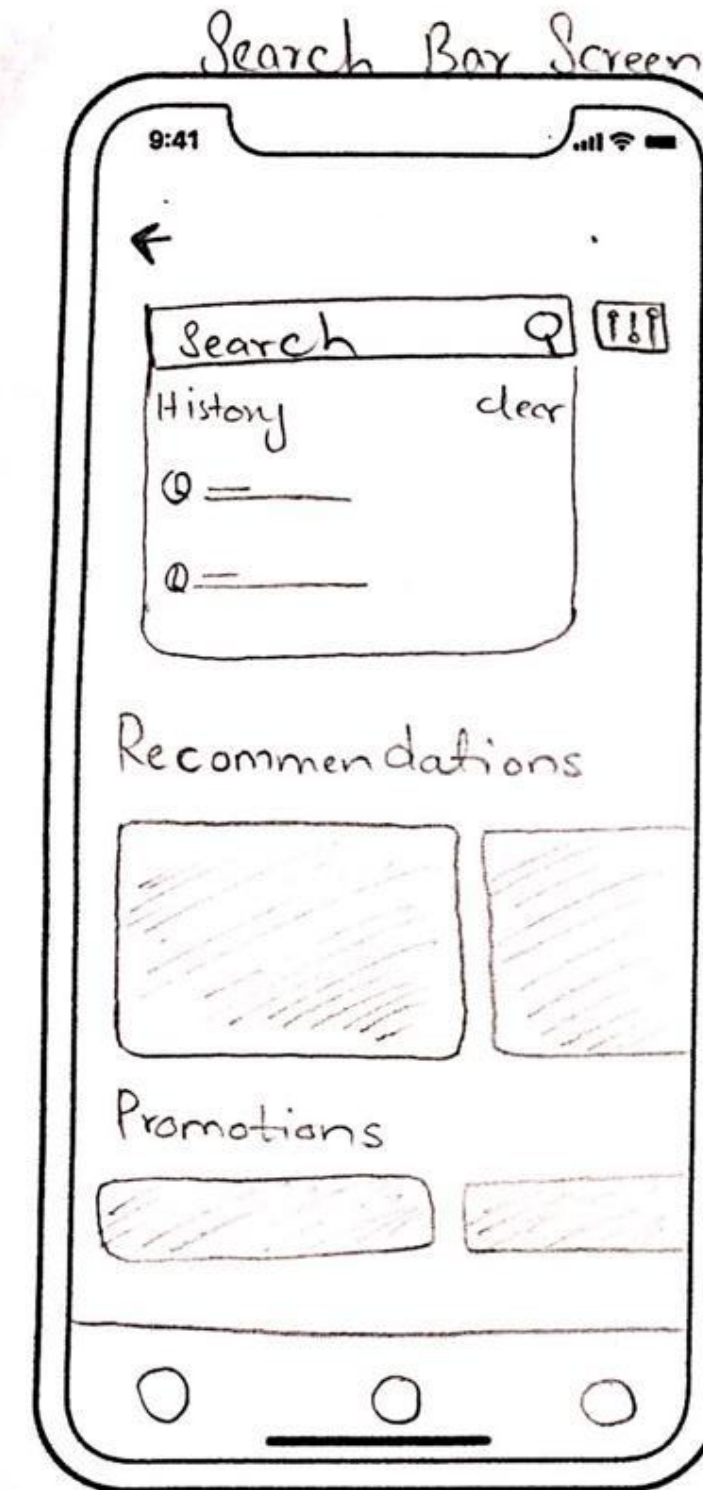
Sketches



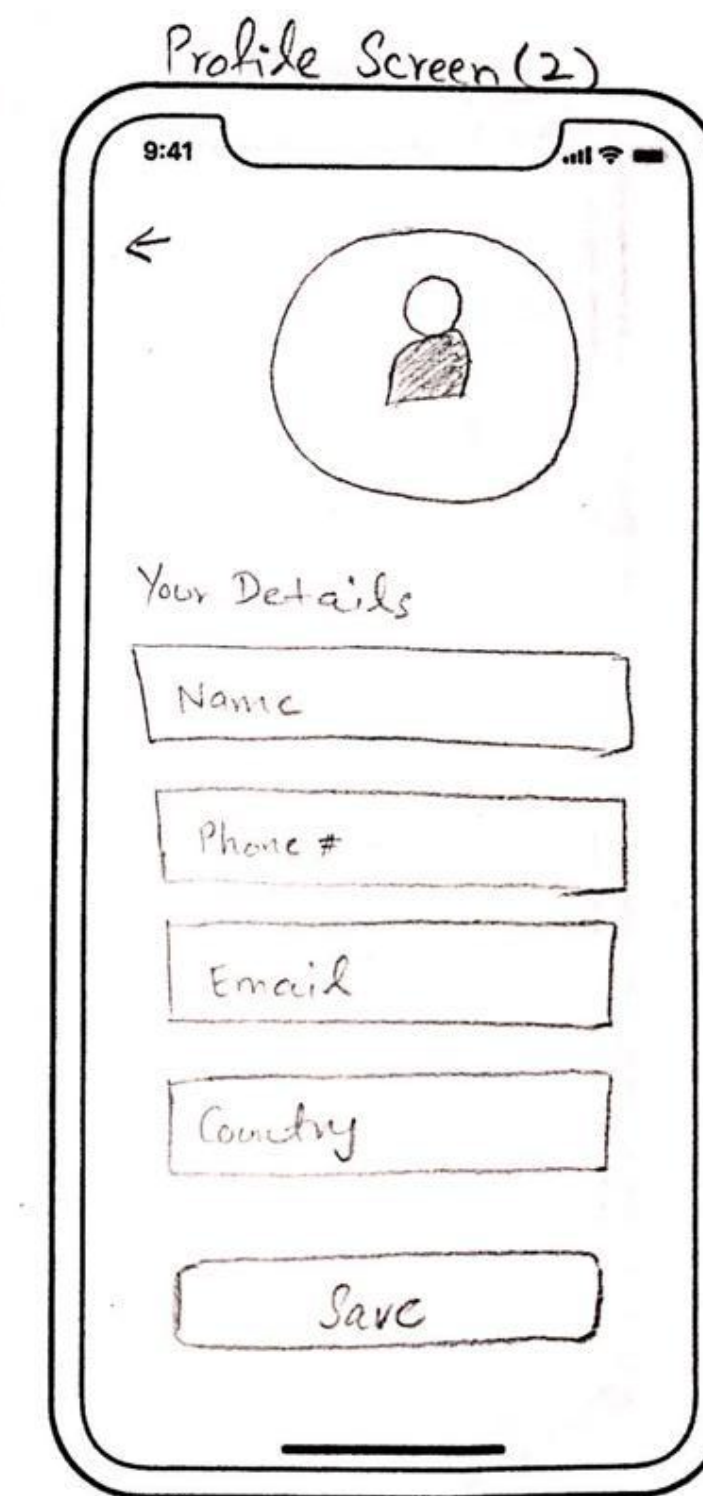
Setting page



Support page

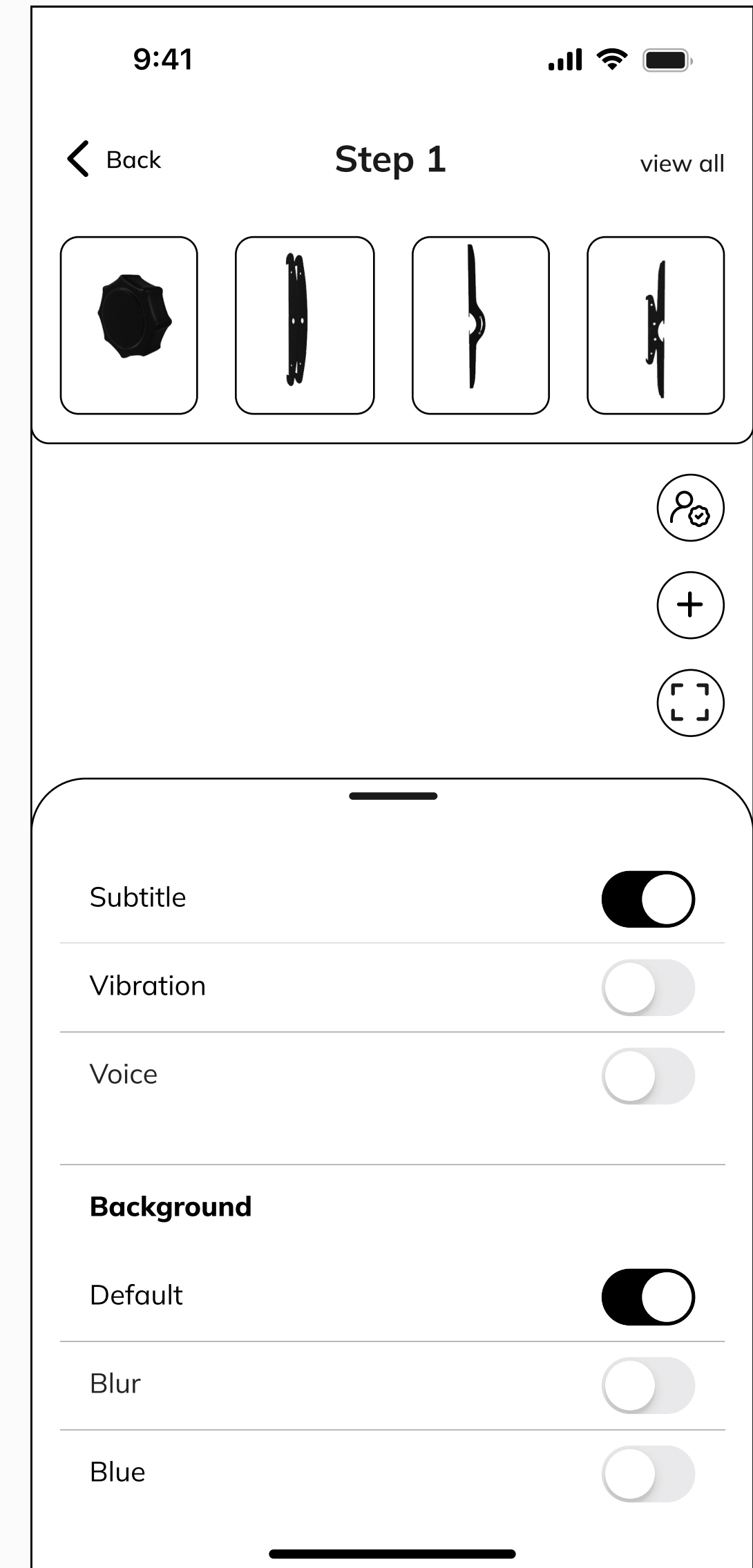
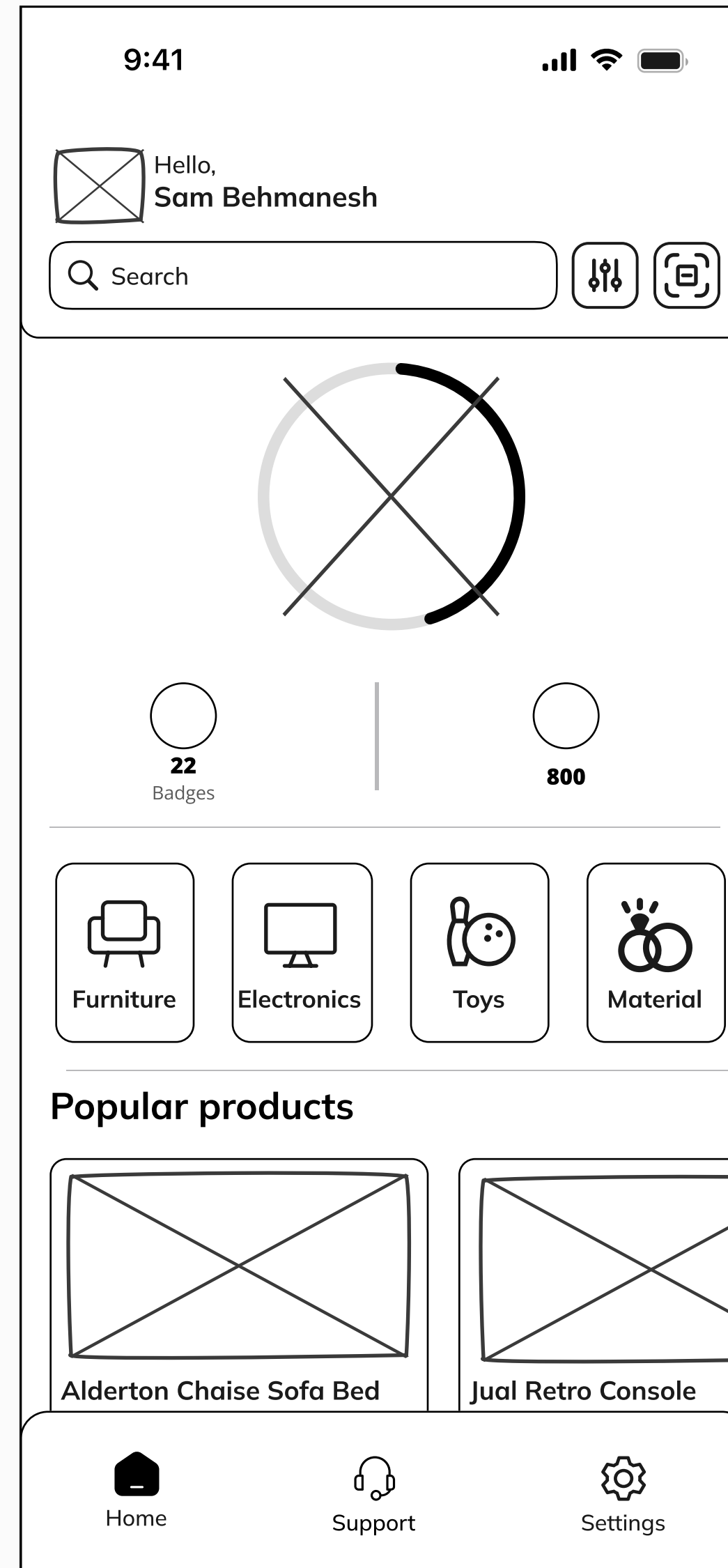
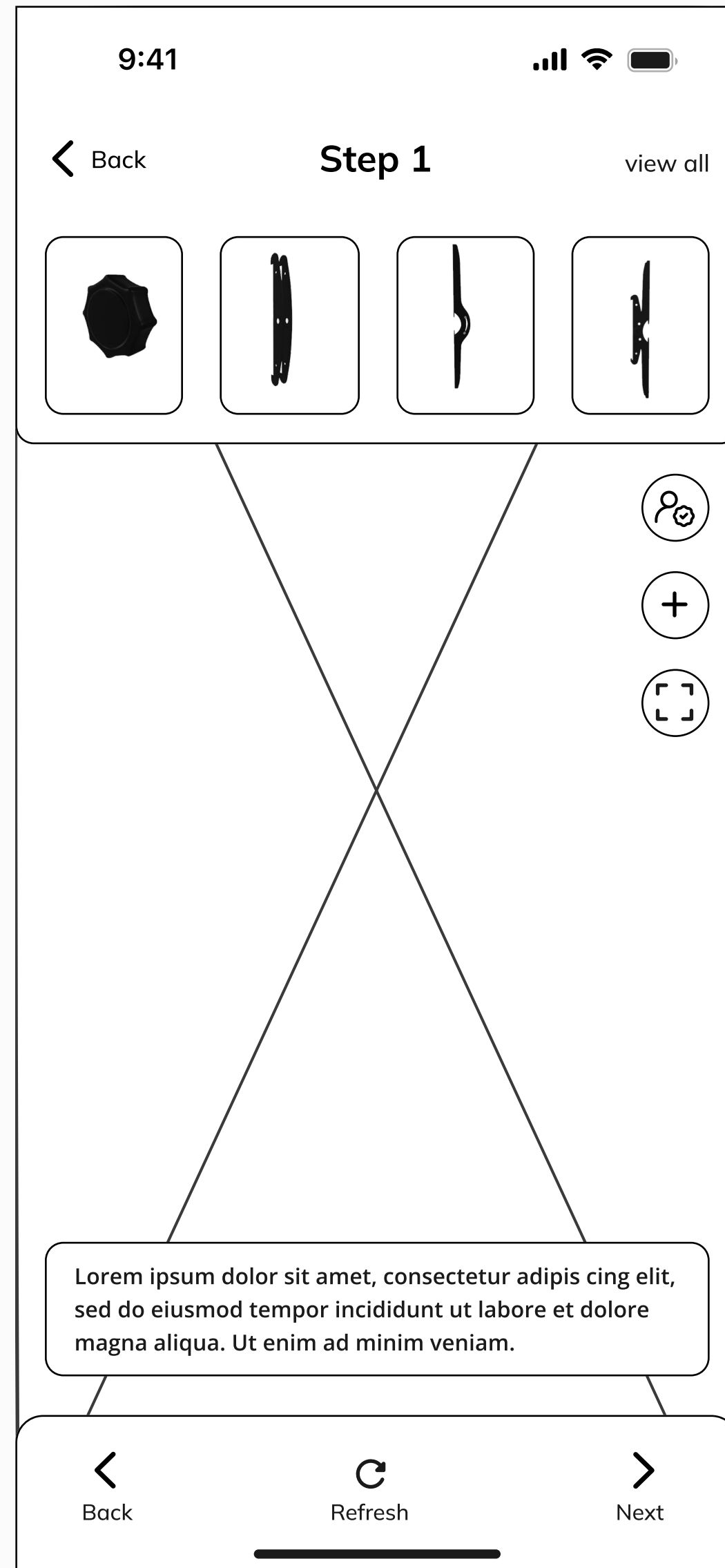


Search page

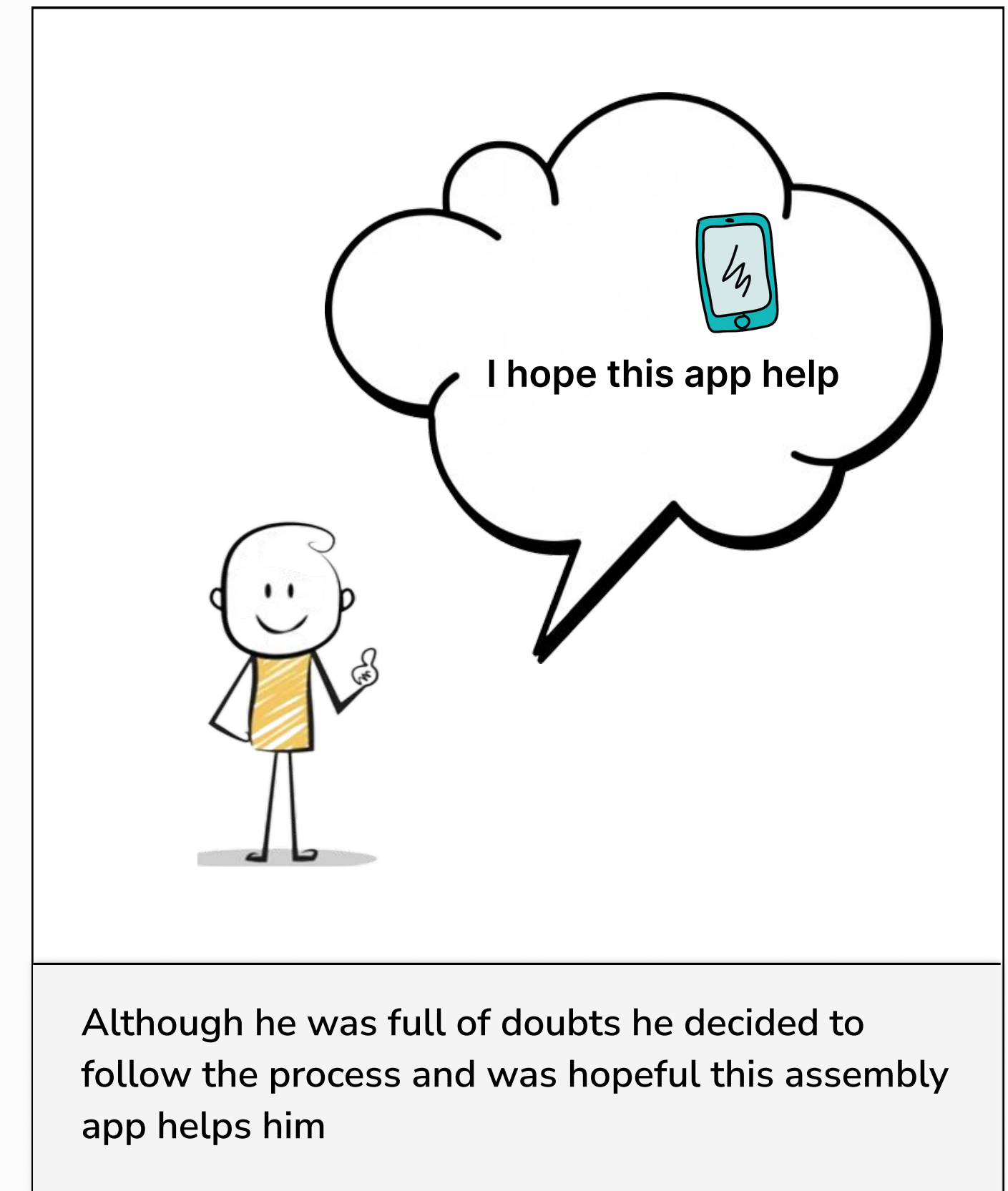
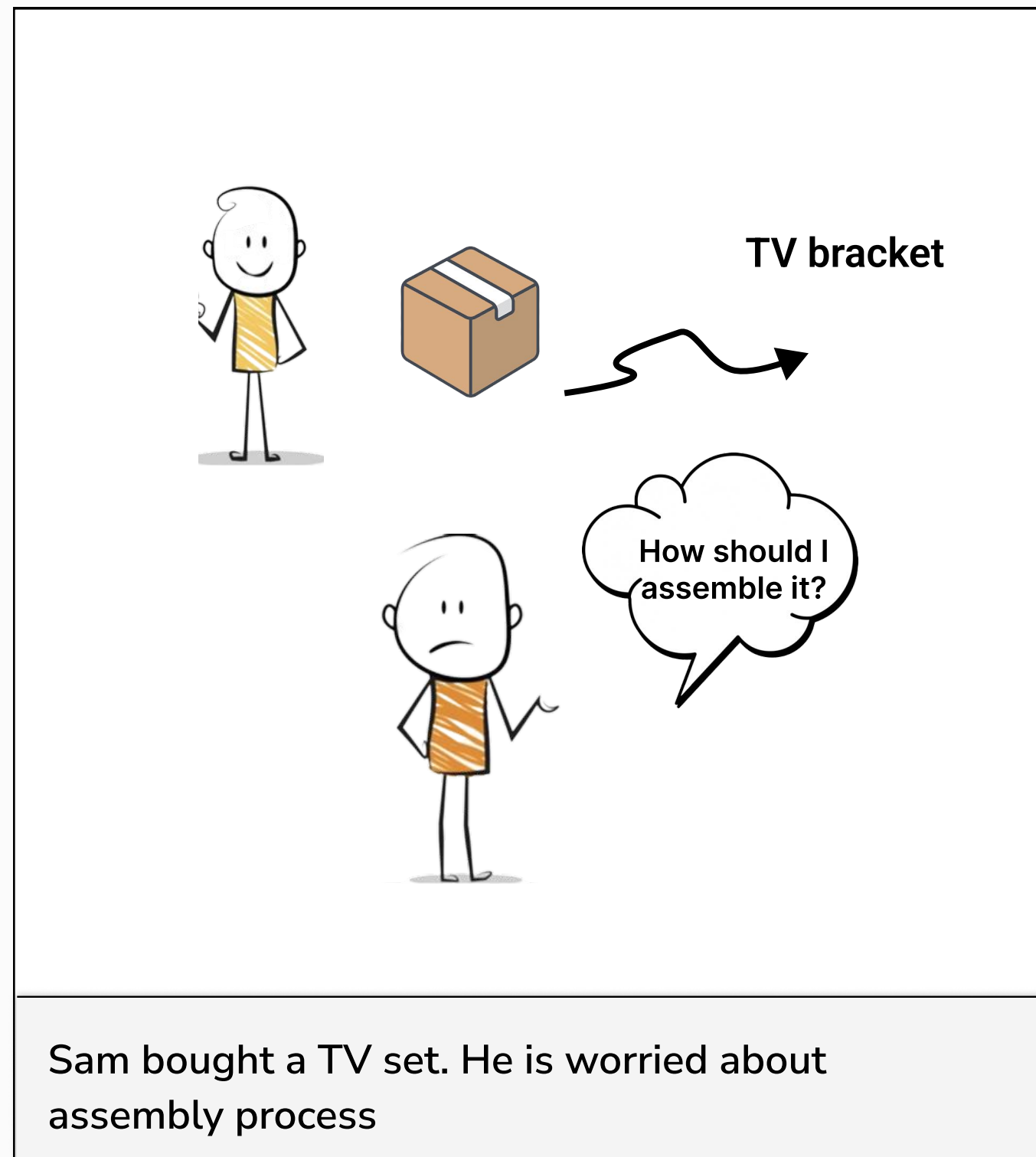


Profile page

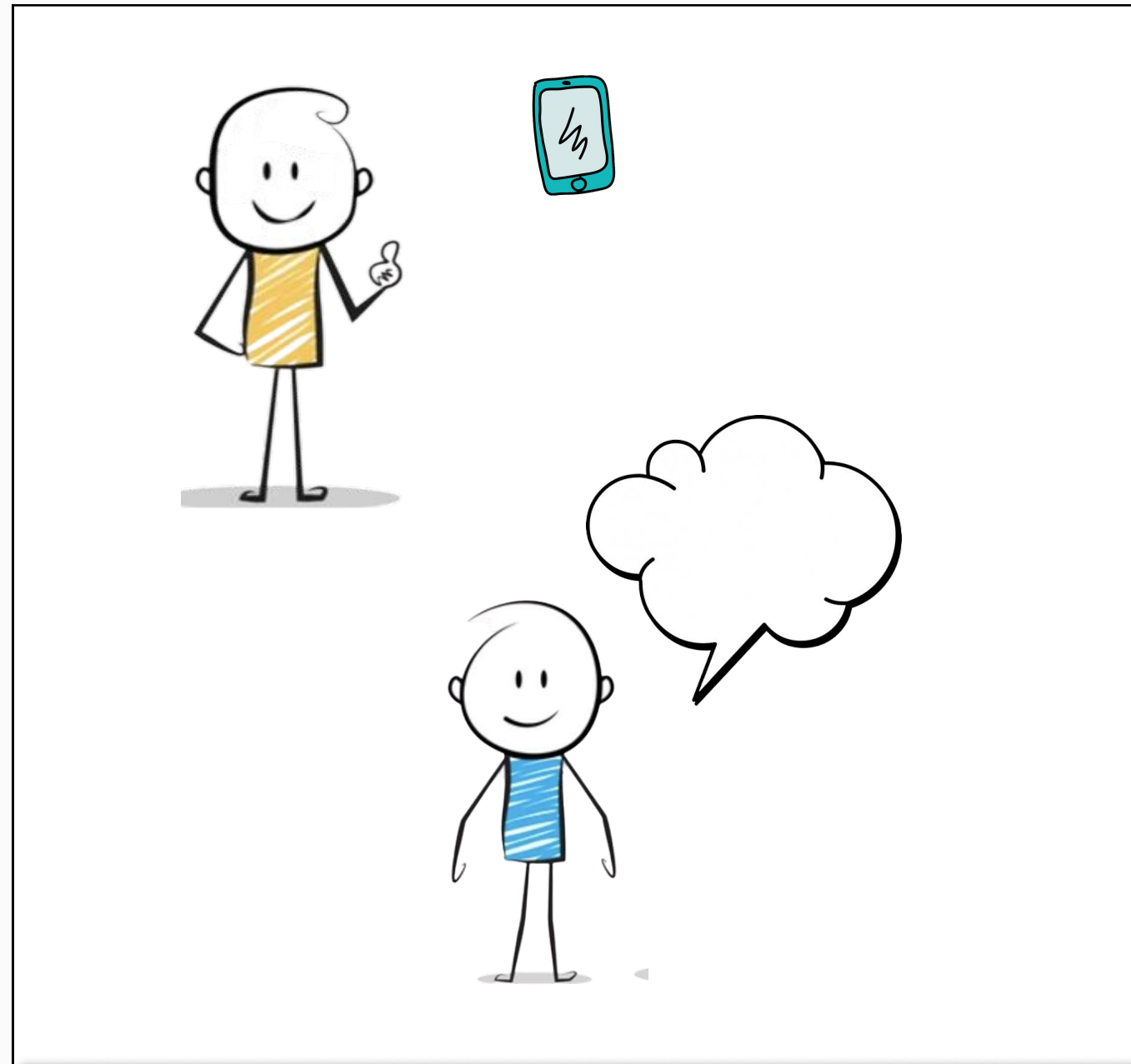
Low-Fidelity



Story Board



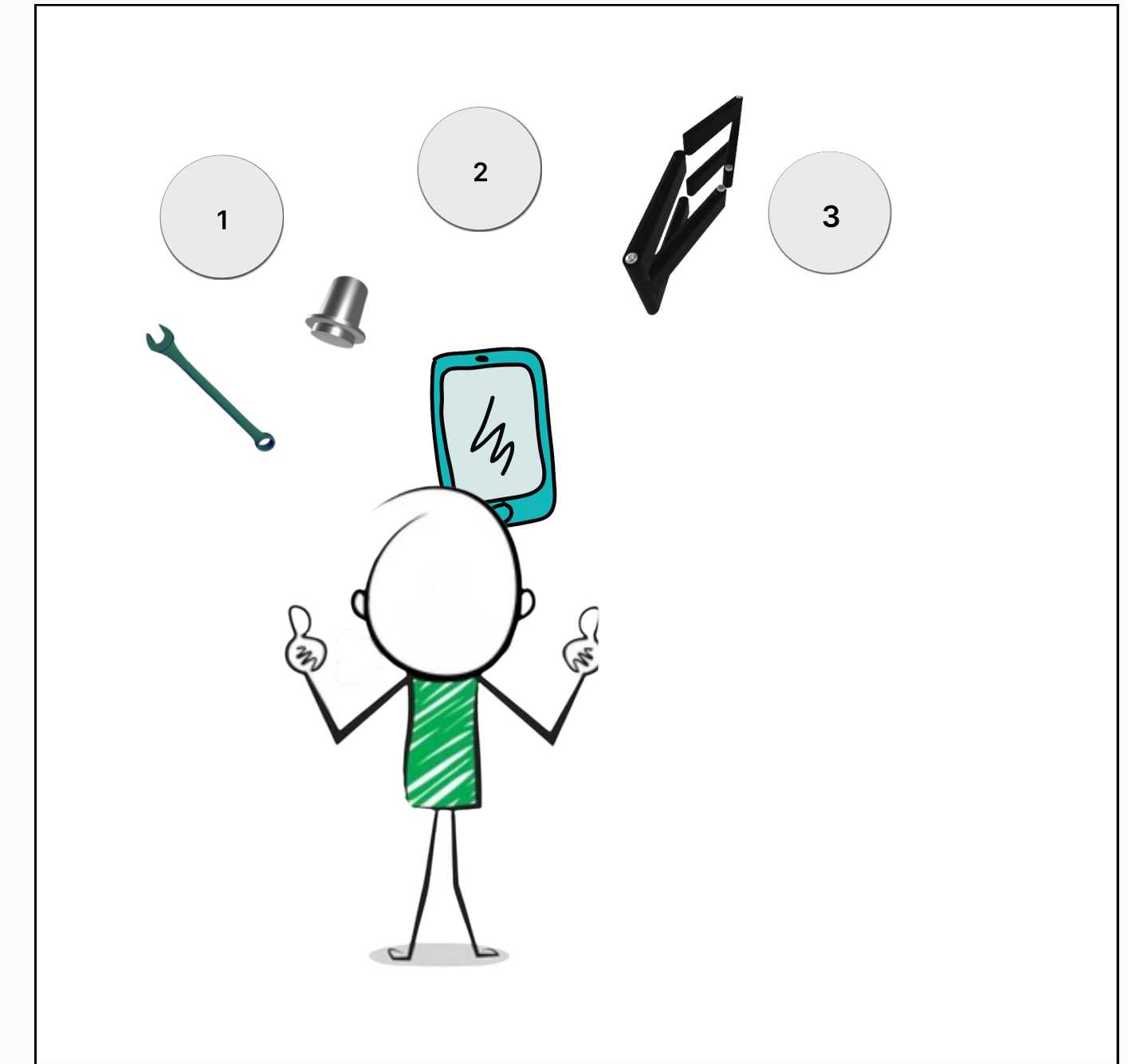
Story Board



He searched the name of TV stand on app after selecting the category section. There saw the preview section consist of time, steps, tools and number of people for assembling.

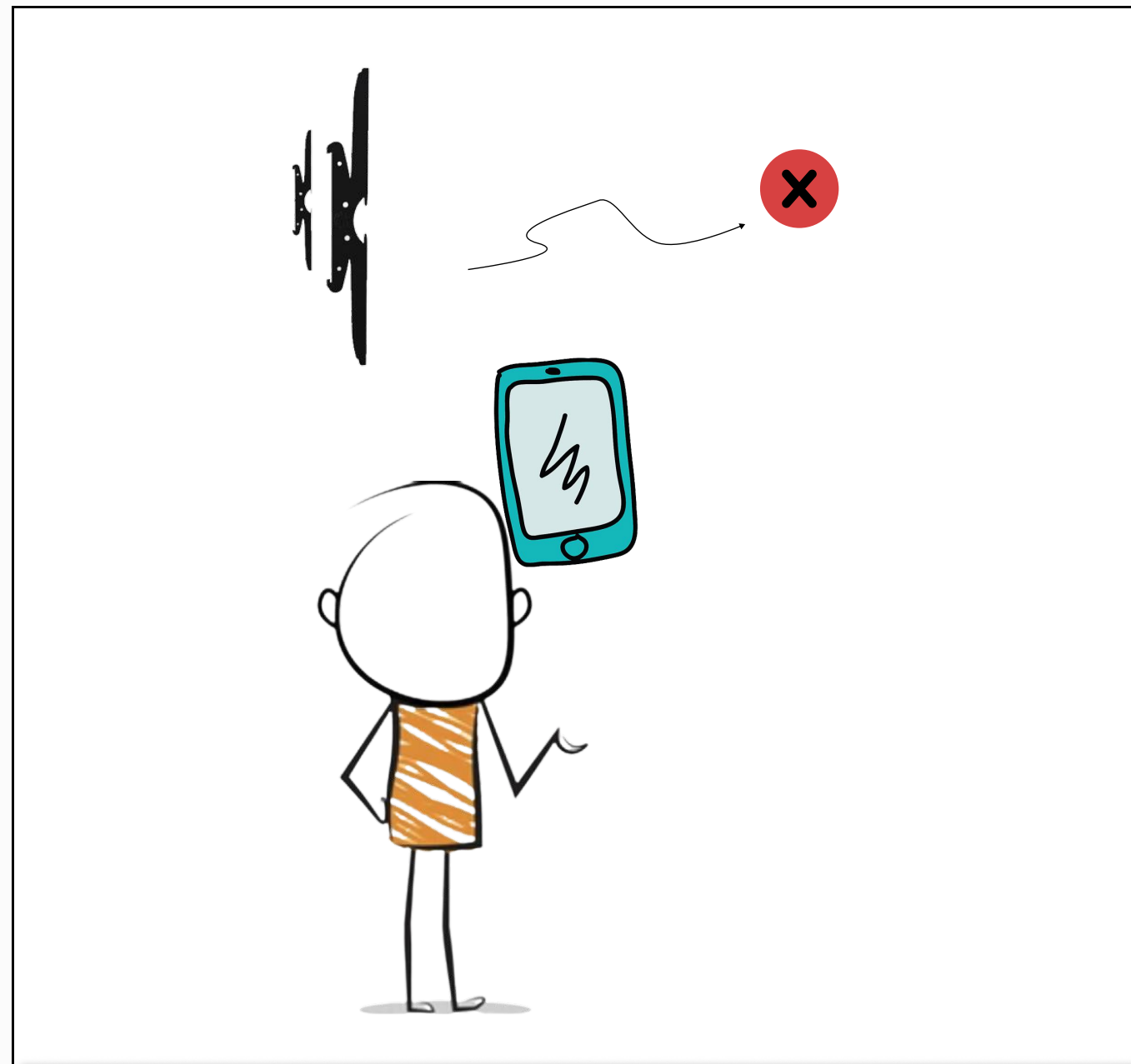


He starts assembling process by bringing the parts showing on top. He is happy because steps seem clear to him now.

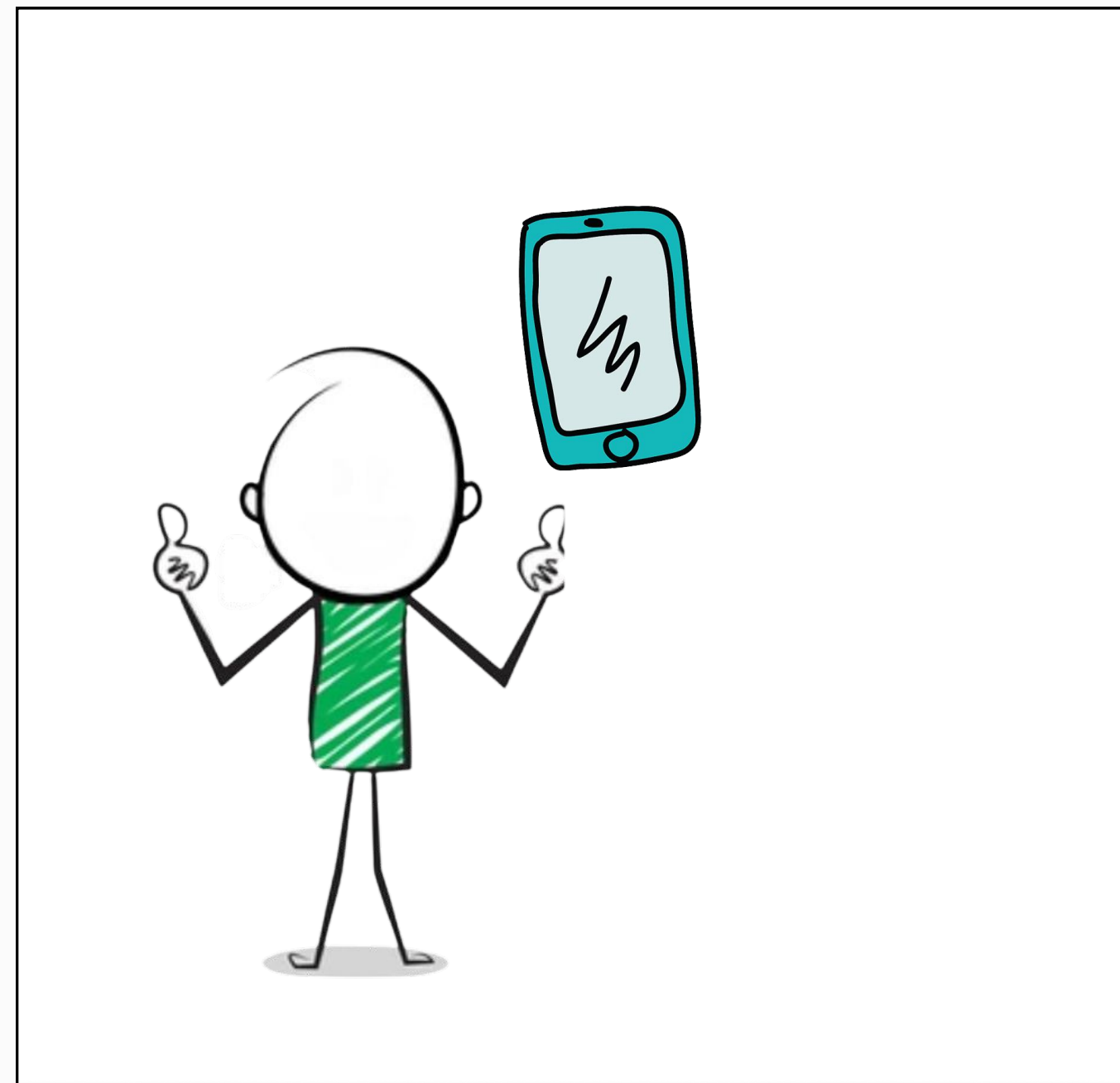


In order to not disrupt others he turns off the voice and activates text.

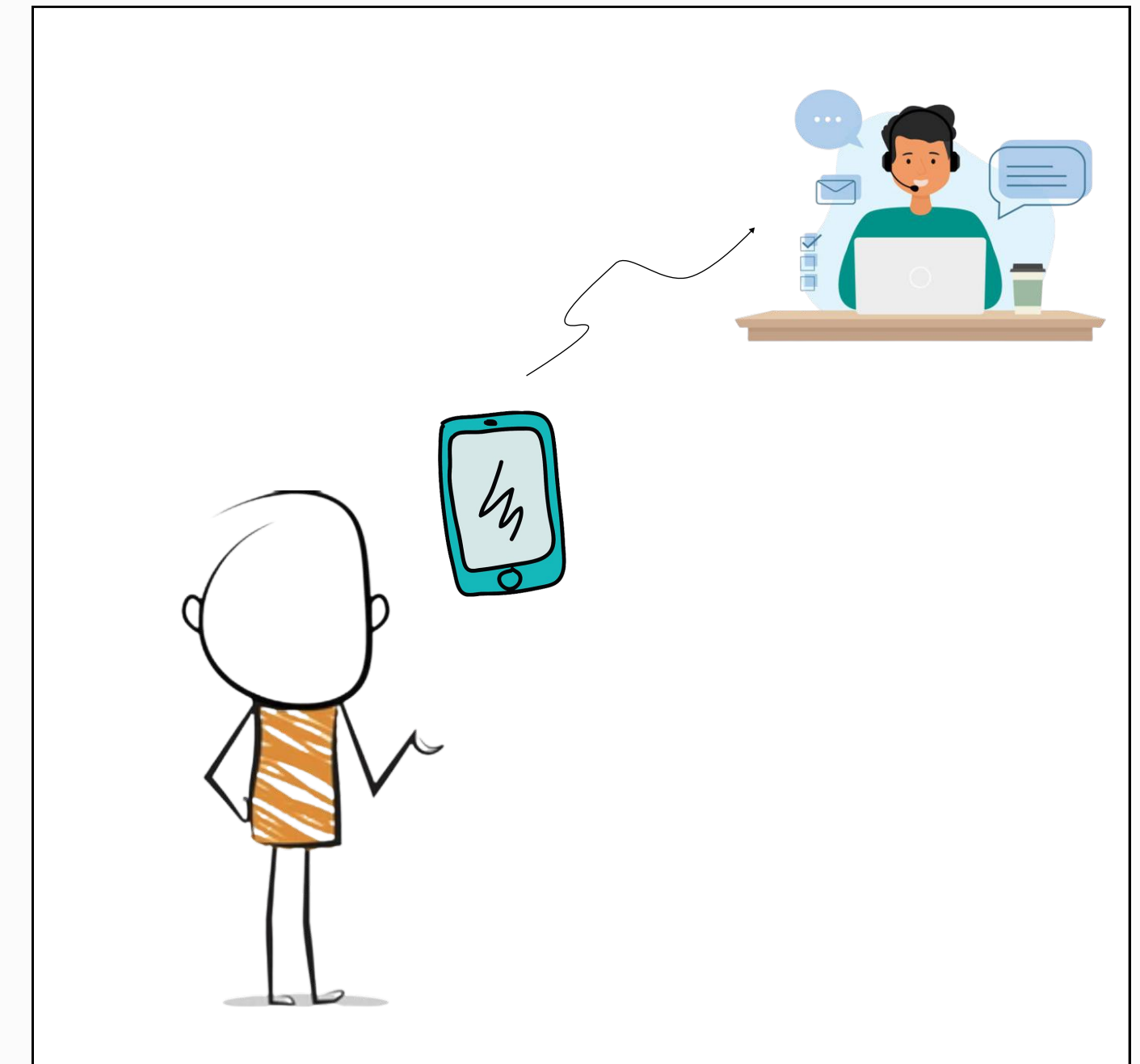
Story Board



After he finished step 1 he holds camera in front of the assembled part and he saw visual error signs and alert with a voice saying 2 sections were connected incorrectly. also there was a vibration to let him know there was a mistake.

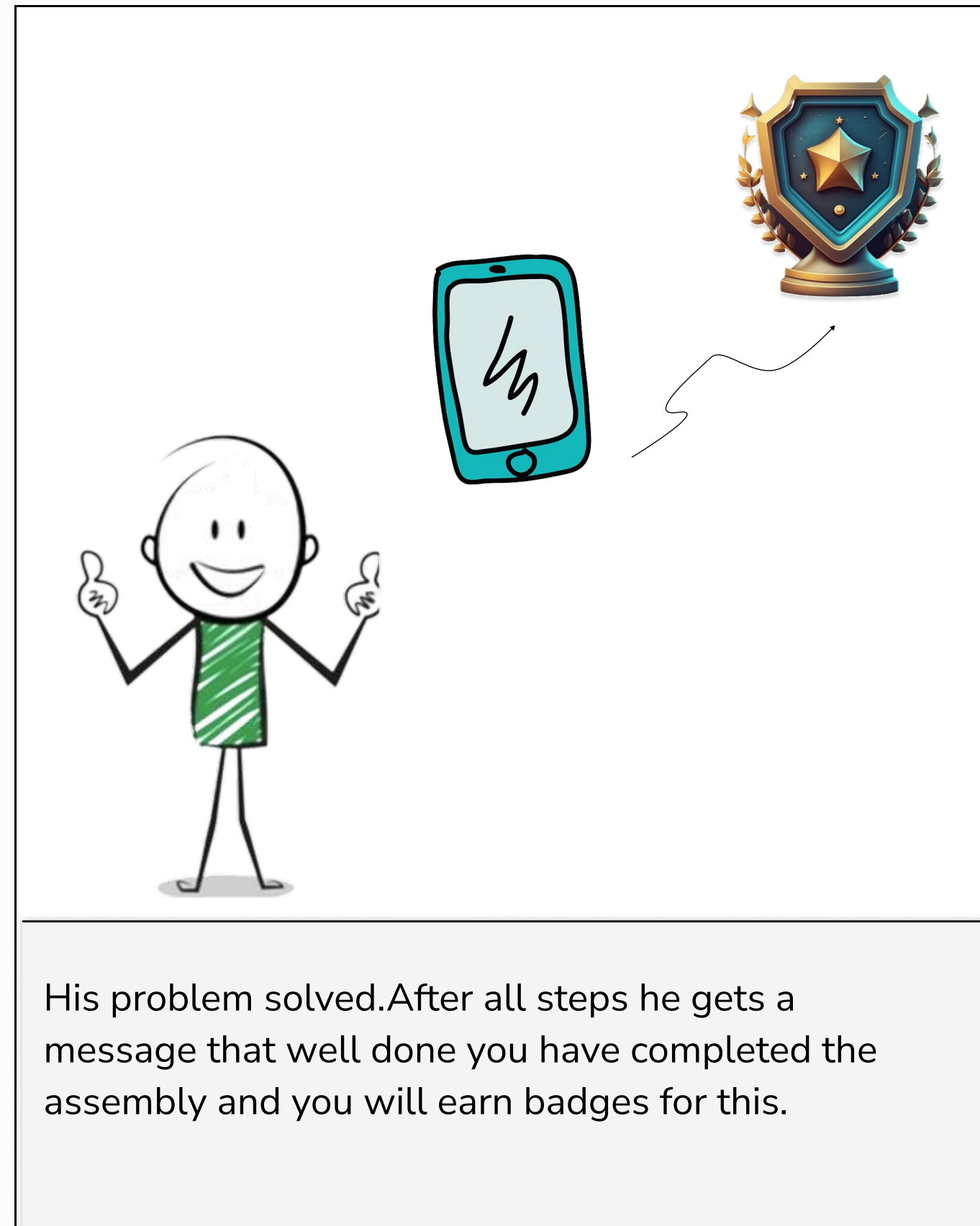


He redo that step by going back and watching the tutorial.

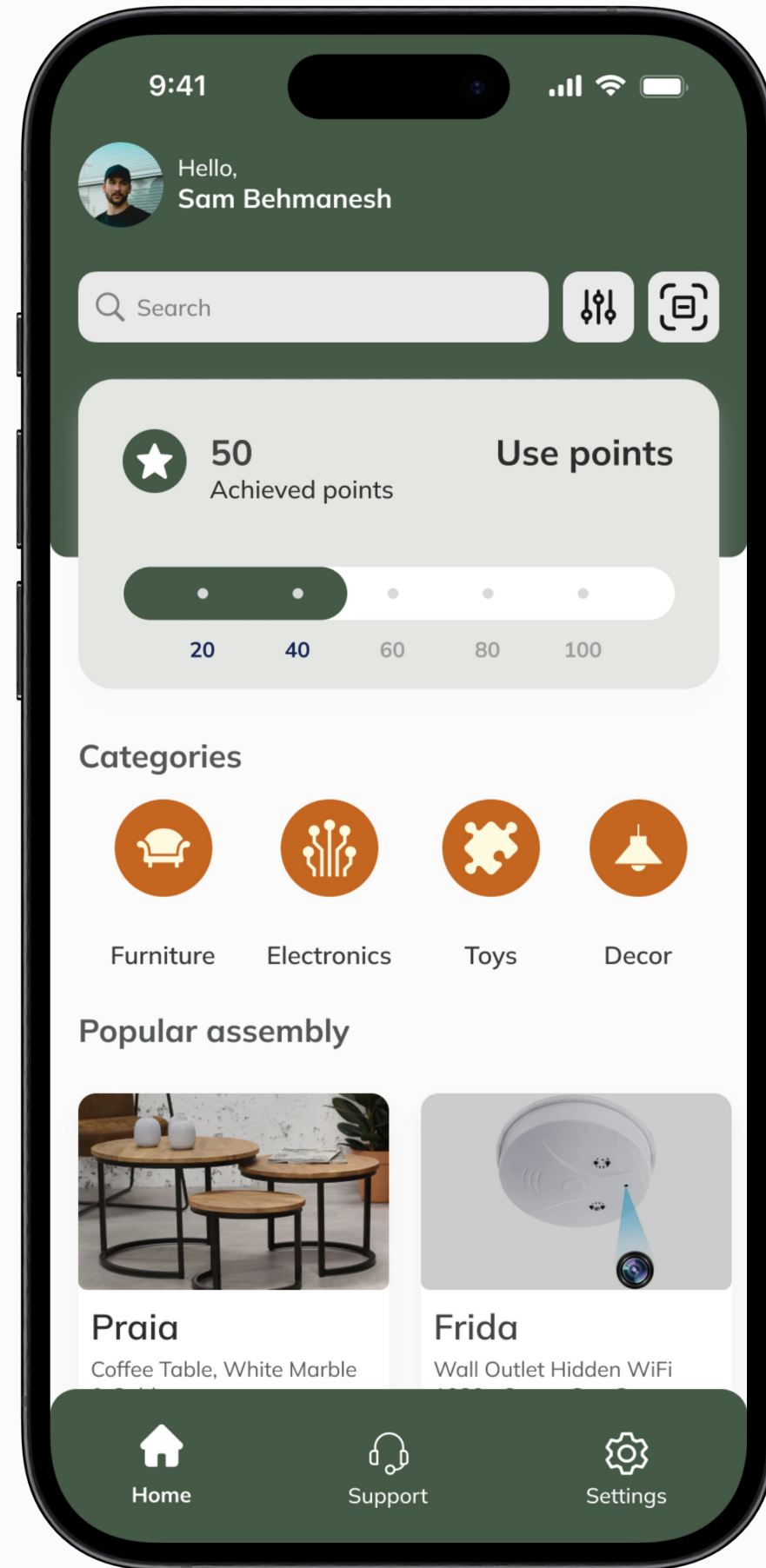


But he didn't know what was wrong, so he called an expert to help him figure out what was wrong and how to fix it.

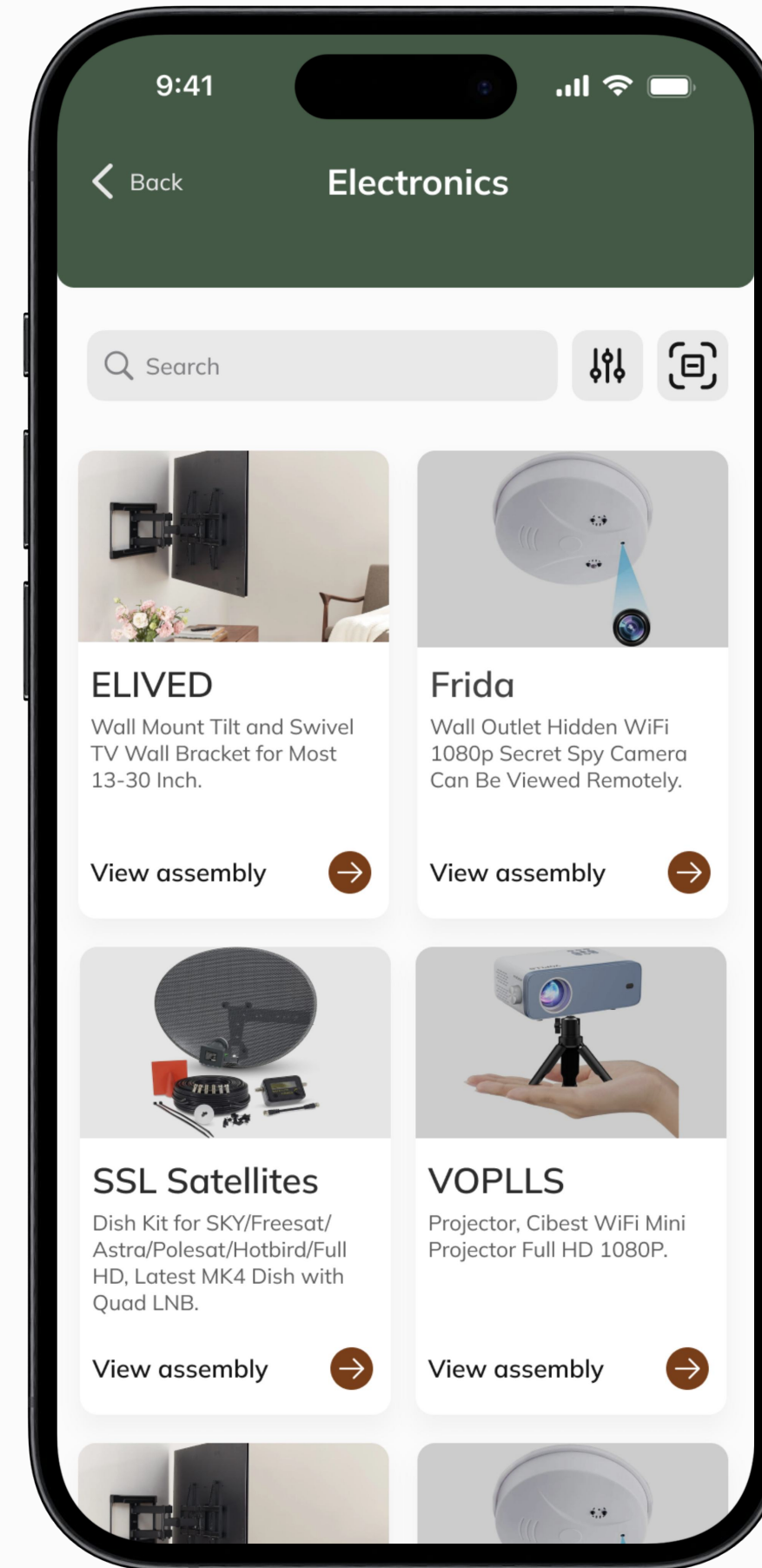
Story Board



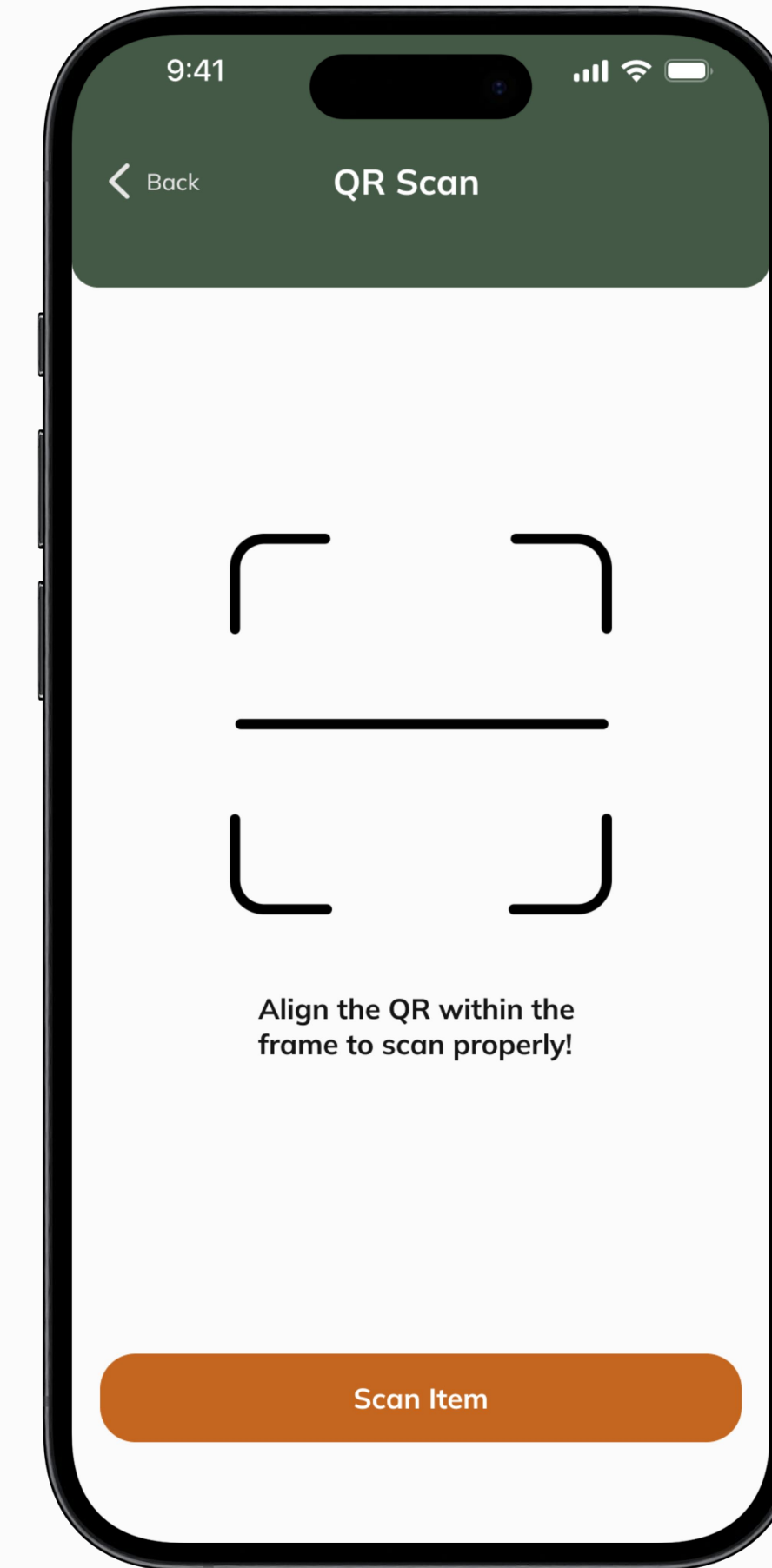
High Fidelity



Home

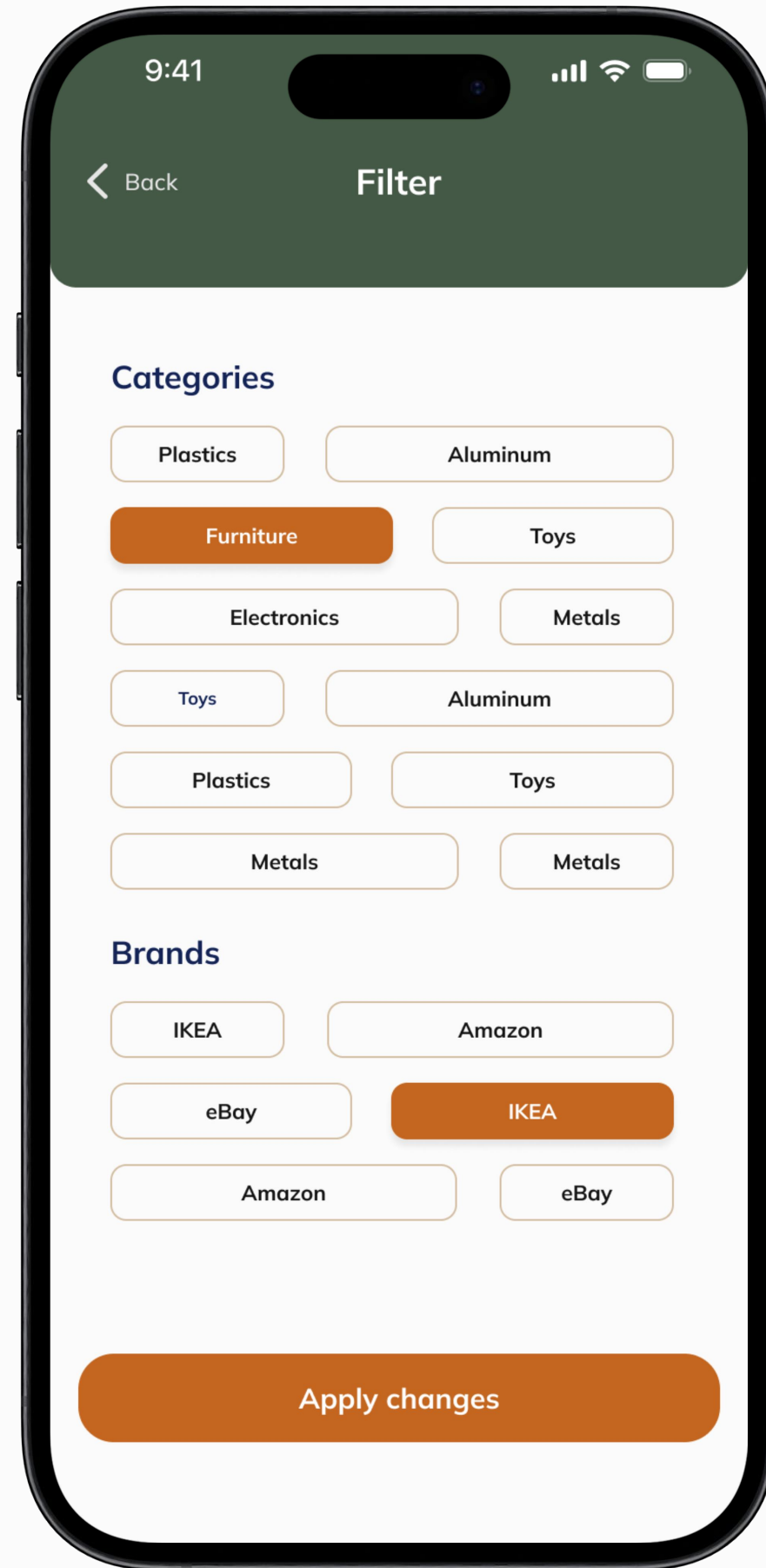


Electronics Assembly

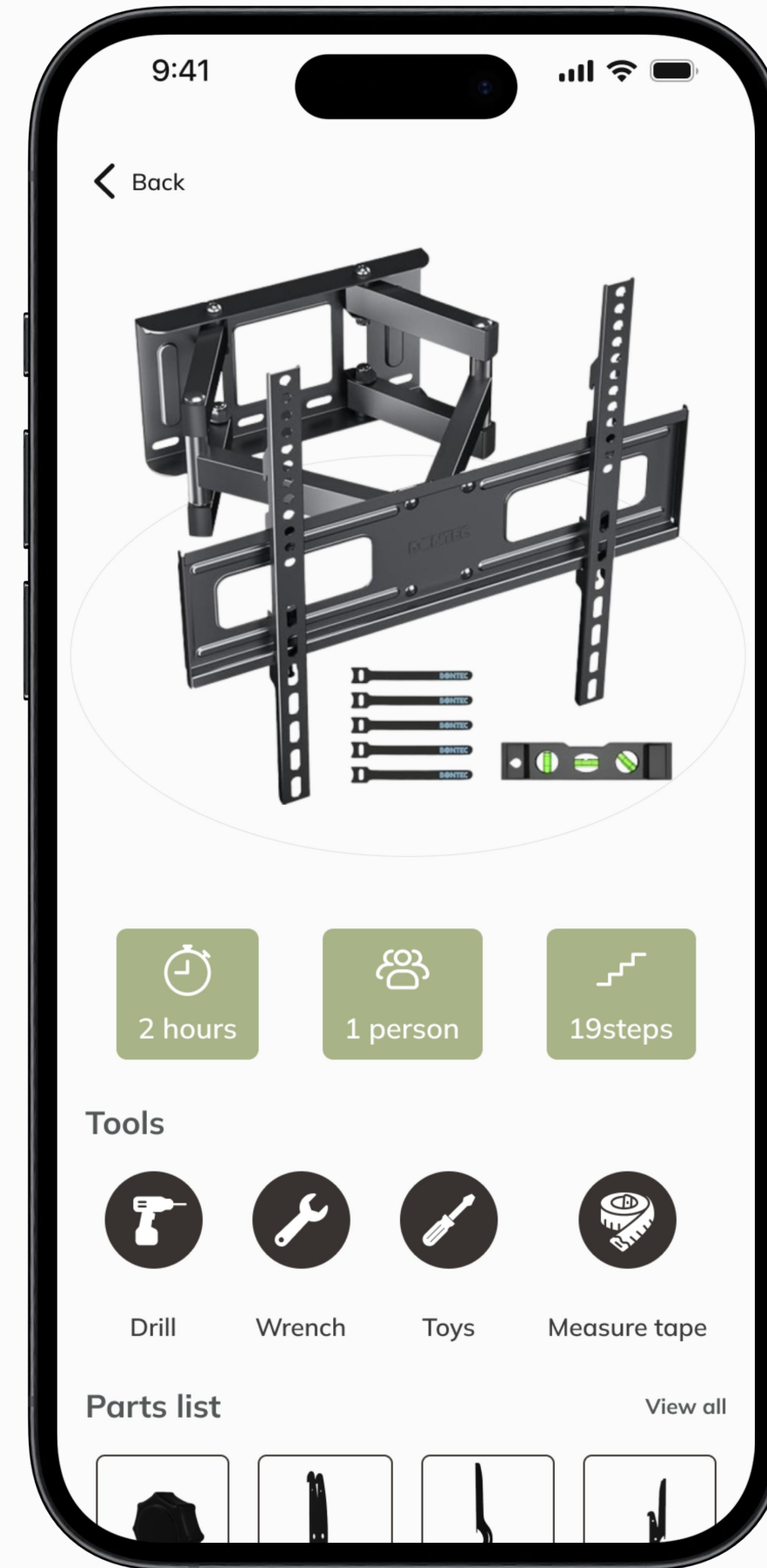


QR Scan

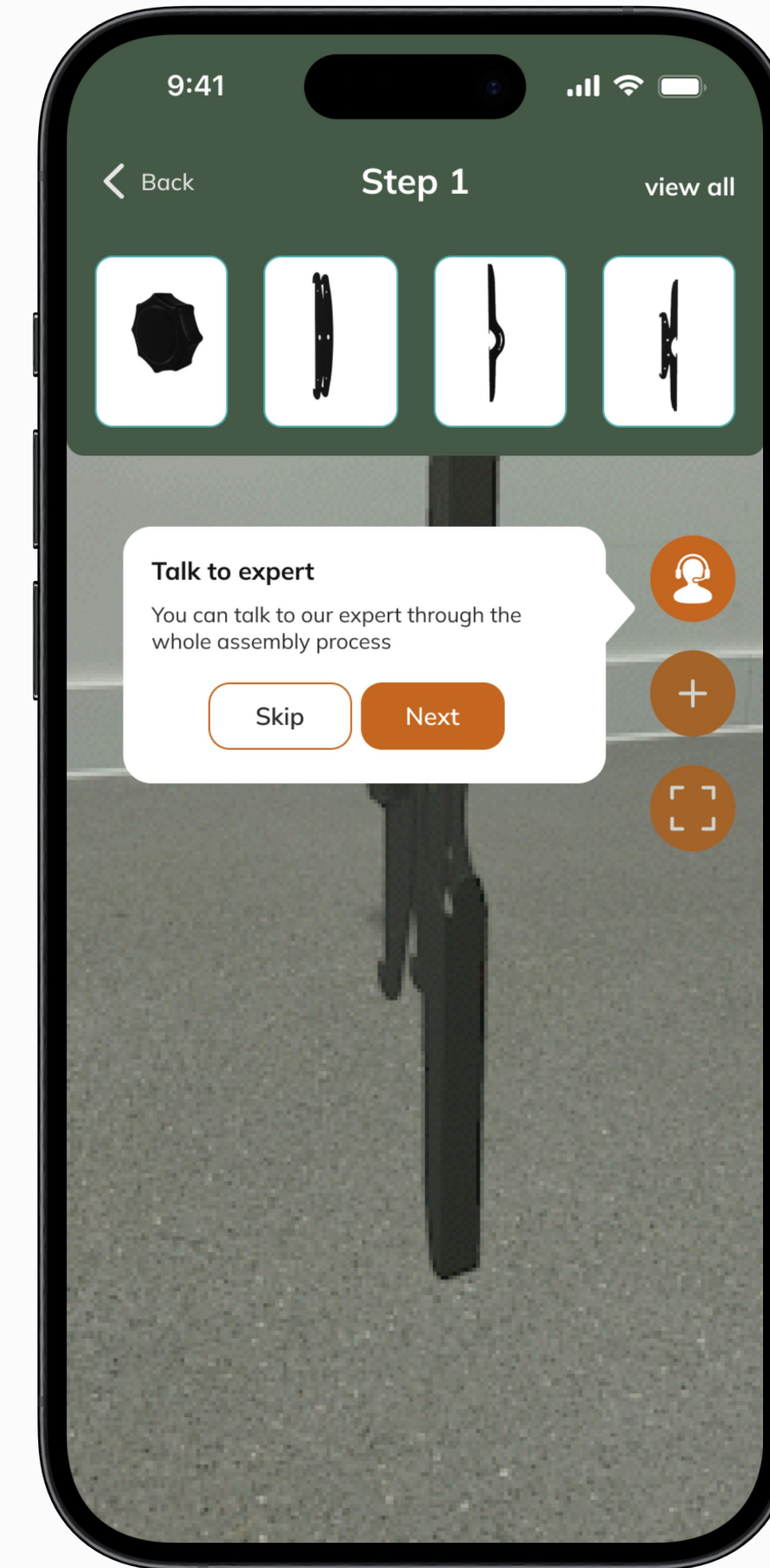
High Fidelity



Filter

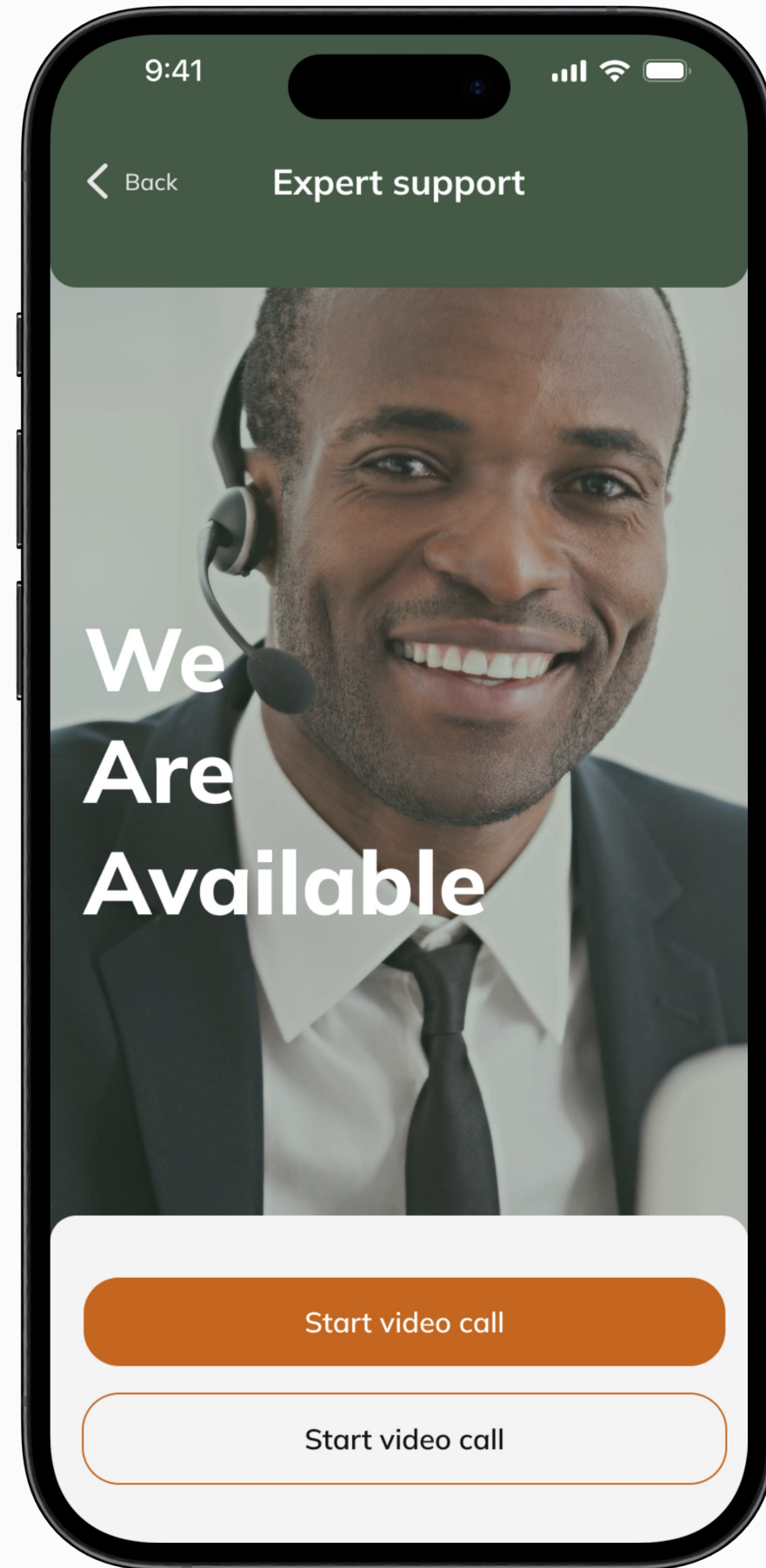


Product Assembly Overview

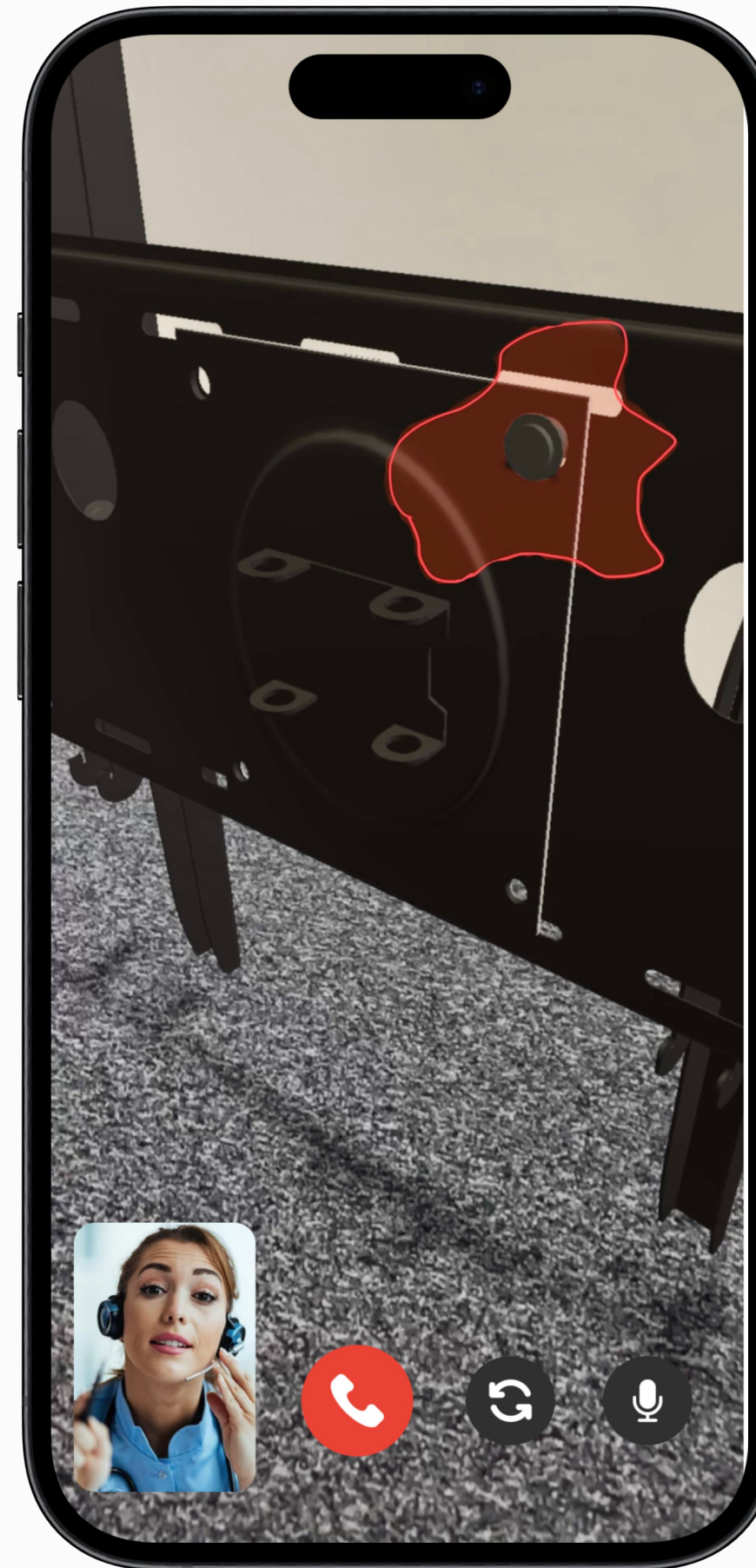


Assembling Guide

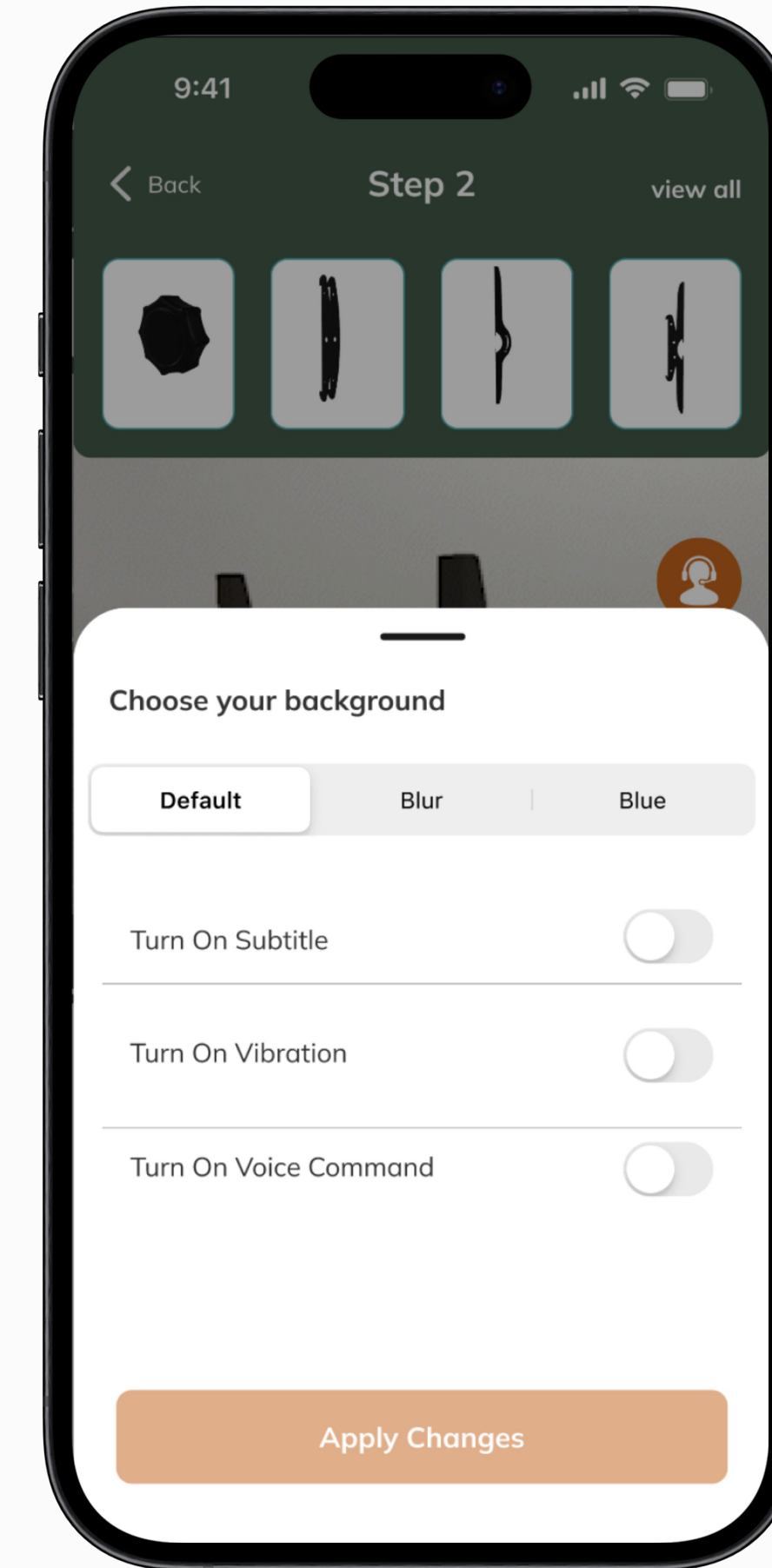
High Fidelity



Connect To Expert



Expert Help



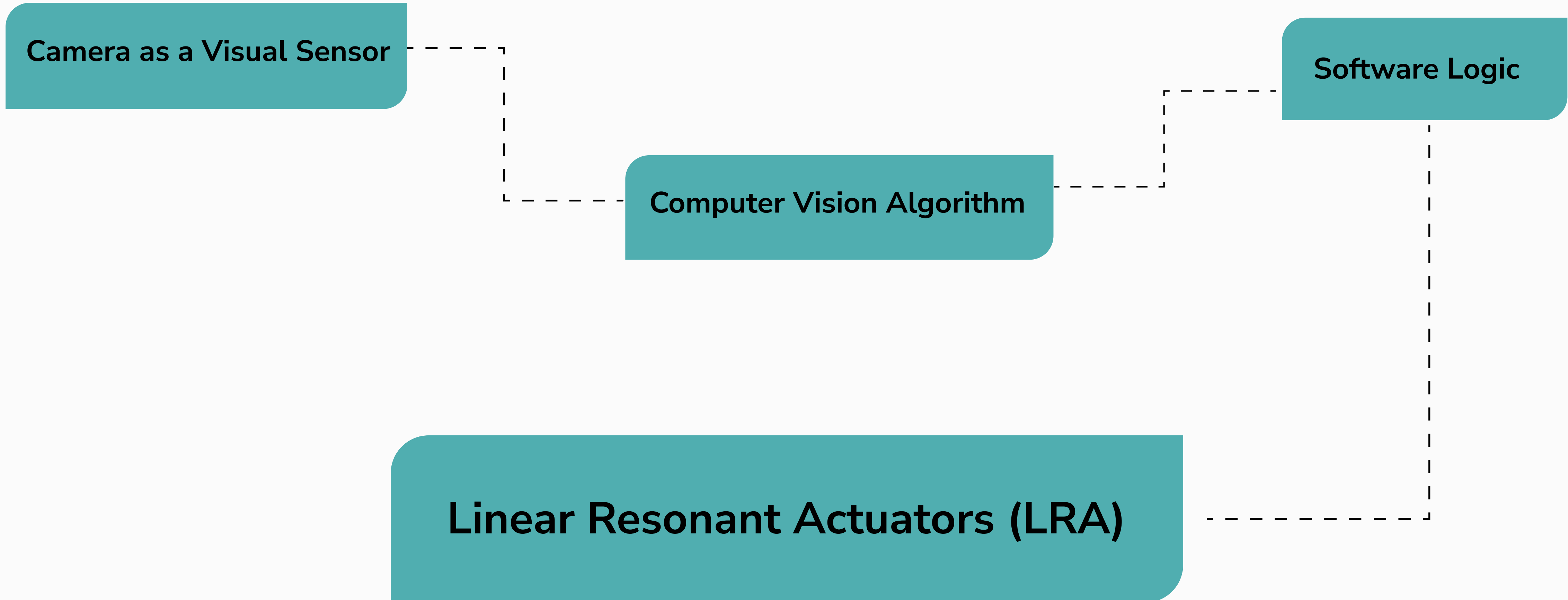
More Options

Features Definition-Visual And Haptic Feedback

- When assembly issues occur, our AR application uses haptic feedback to immediately alert users through a tactile response. This feature enhances the user experience by providing a physical indication of errors, making the process more immersive and intuitive.
- Our AR application enhances user experience by providing visual feedback alongside haptic alerts during assembly issues. When a problem arises, users will see a clear, red indicator on their mobile display. These user-friendly visual cues make it easy to quickly identify and resolve any issues.

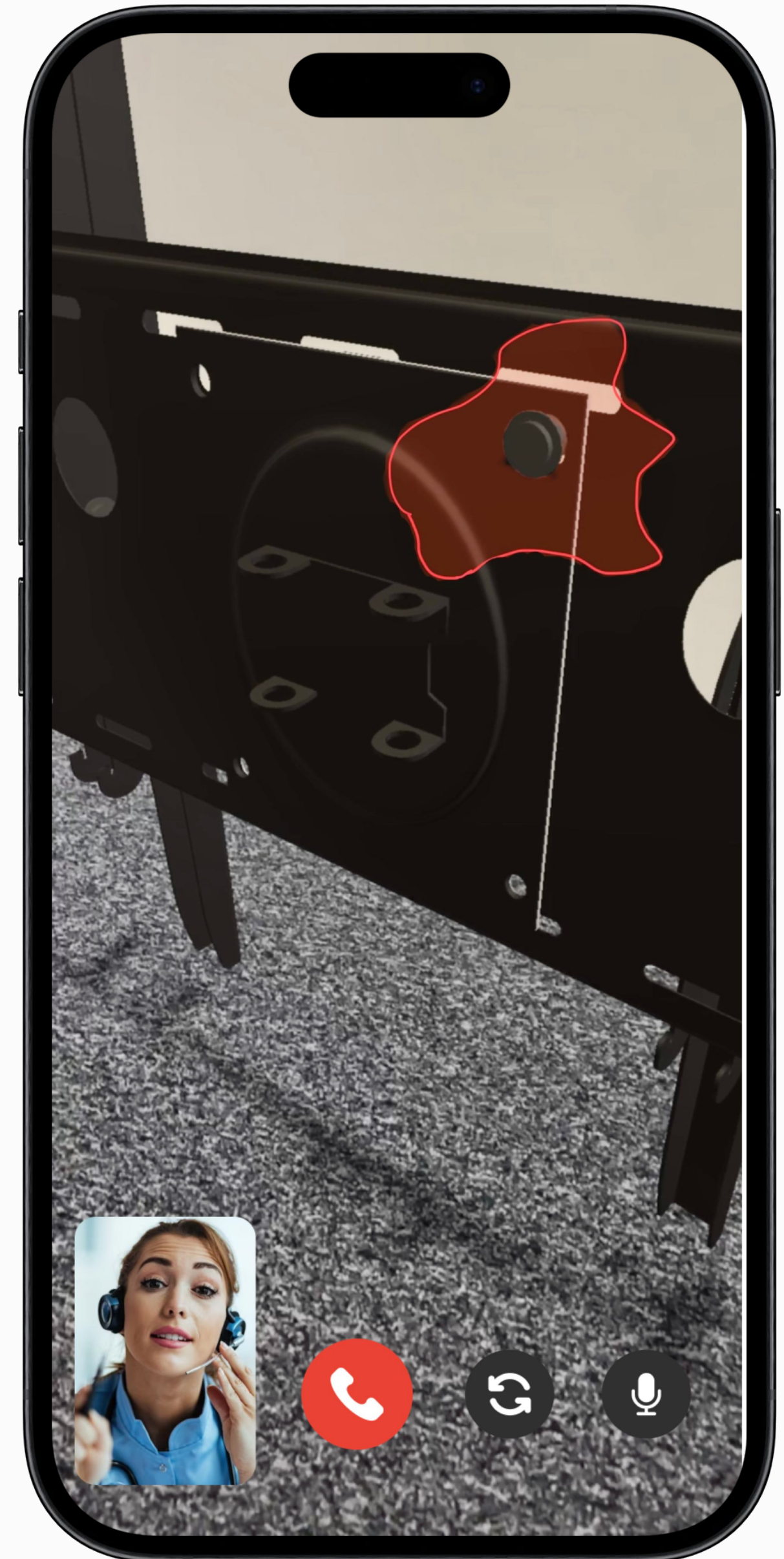


Features Definition-Haptic

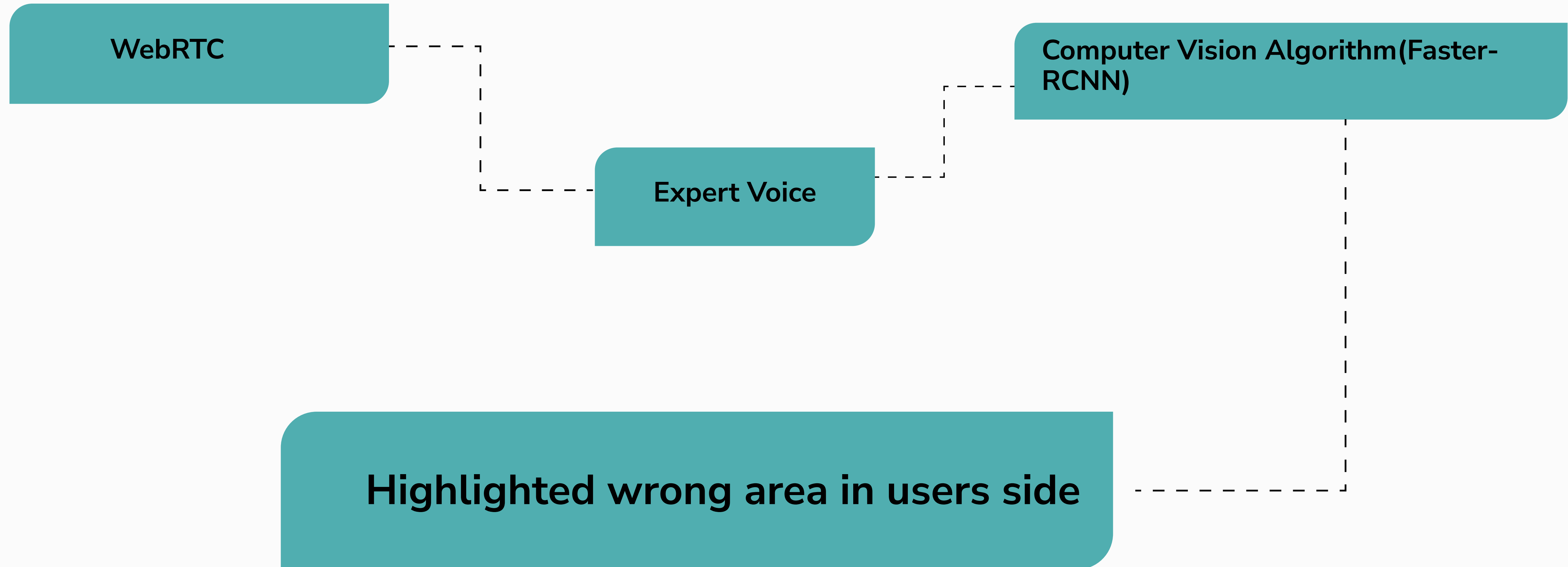


Features Definition- Expert Support

When users encounter assembly difficulties, they can initiate a real-time video call with an expert. By pointing their device's camera at the task, the expert views the situation live and can guide the user, highlighting any incorrect parts based on their feedback.



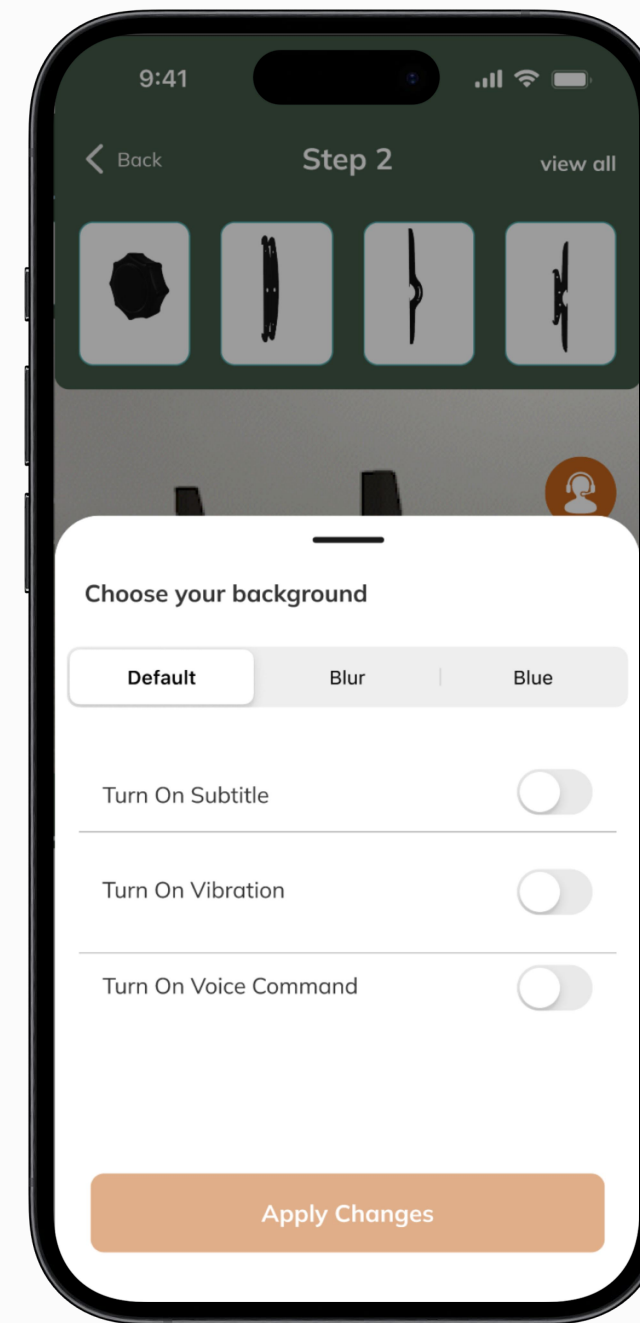
Features Definition- Expert Support



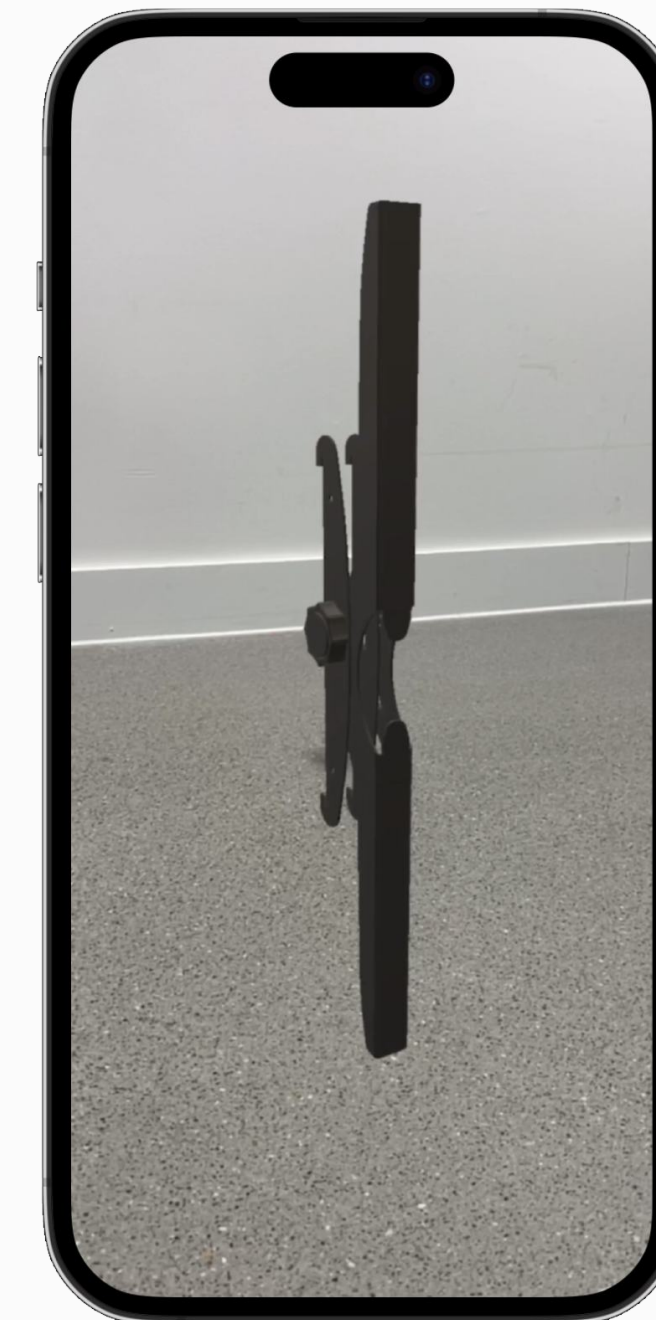
Features Definition- Different Kinds Of Background

Users have the ability to personalise the background to suit their preferences by selecting from three different options.

- 1- The original, genuine background.
- 2- A blur background
- 3- A blue-coloured overlay



Blue



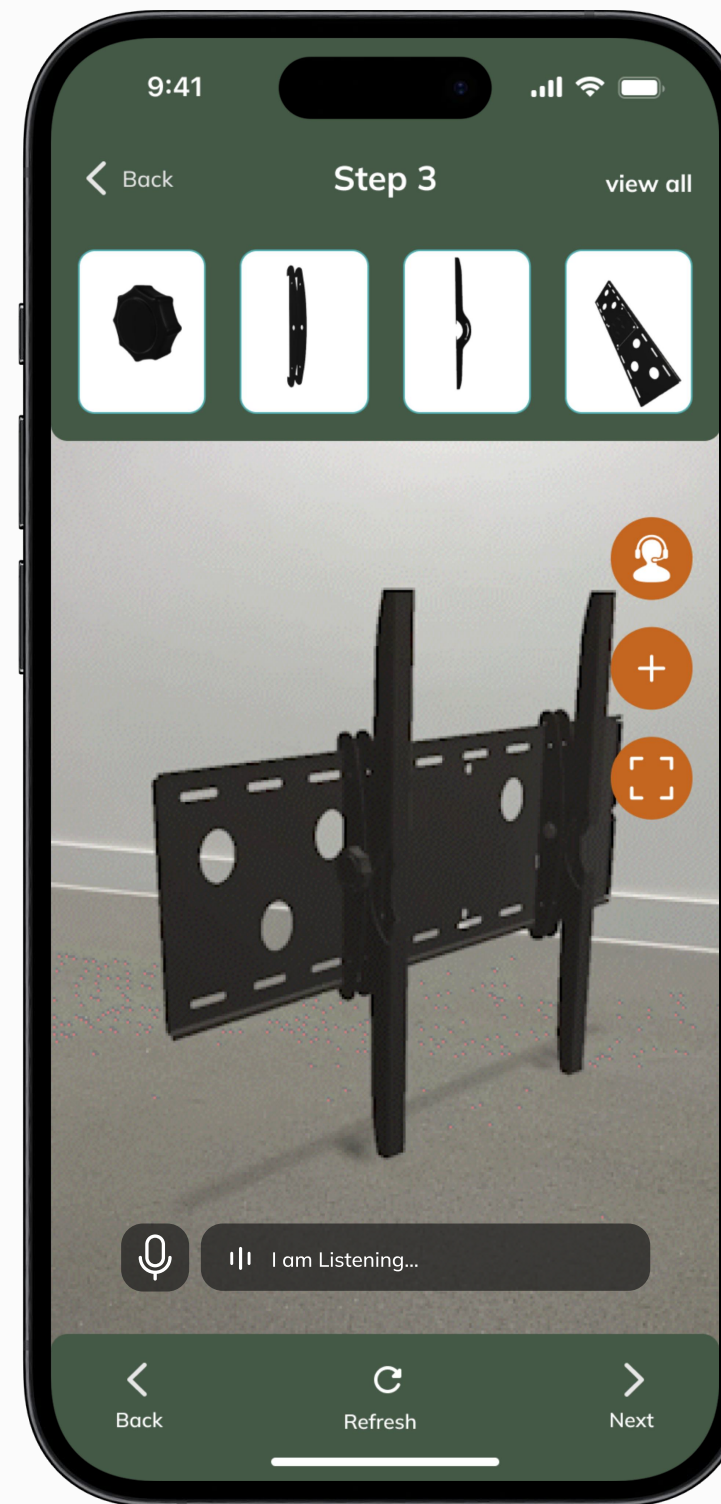
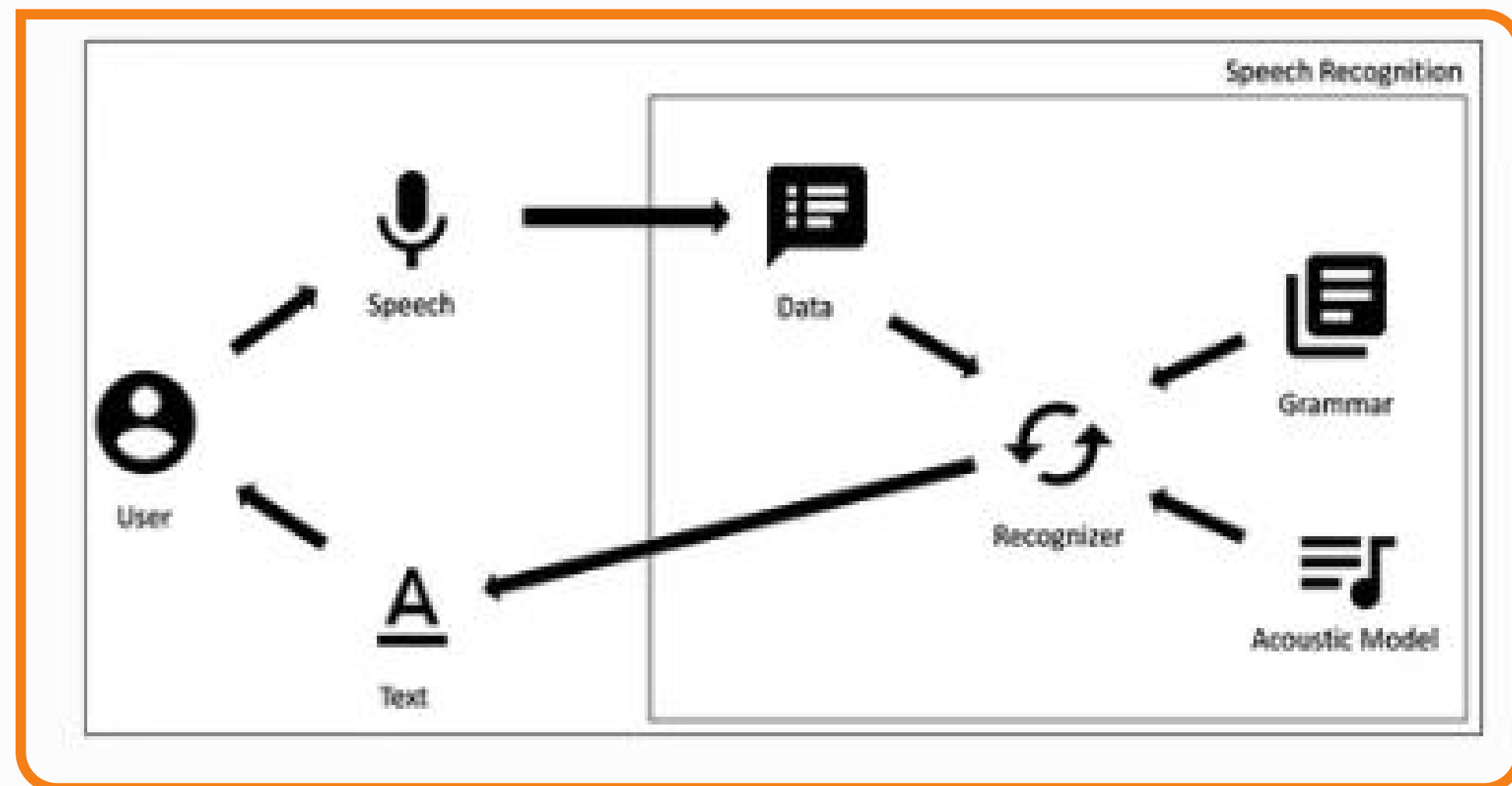
Default



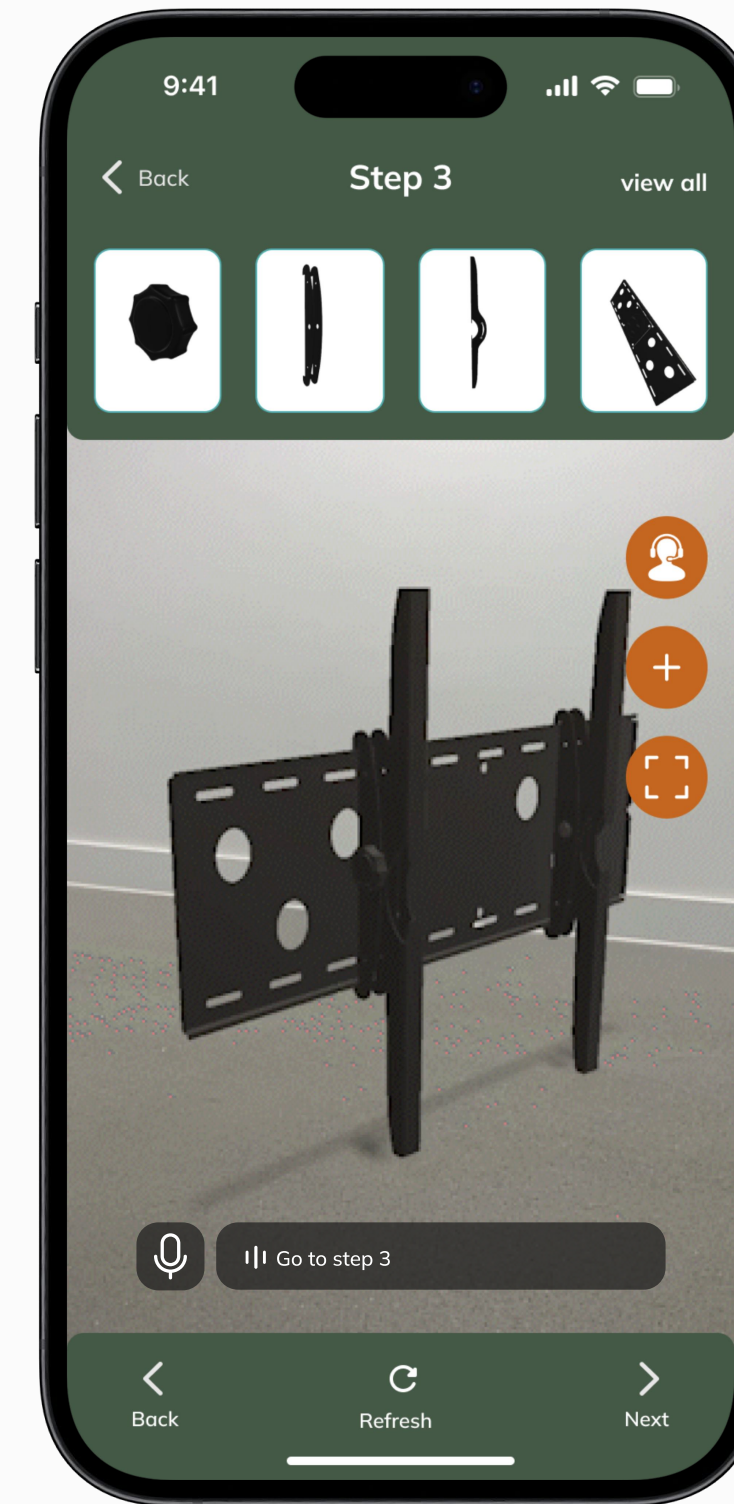
Blur

Features Definition- Voice Command

Voice commands, enabled by a microphone sensor, allow users to interact hands-free with the application using speech recognition, facilitating easier navigation and function search during assembly.



Voice Command Active



User Talks



System Shows Feedback While Processing The Command

Features Definition- Object Recognition

Object recognition technology enhances our application by addressing assembly challenges in several ways. It aids users in identifying assembly steps by naming the object and its corresponding step, as shown in figure 1. Additionally, during or after assembly, users can present the object to the camera to identify incorrect parts through visual, voice, and haptic feedback. In the expert section (fig 3), the technology also helps experts point out errors, providing users with clear visual indicators of mistakes.

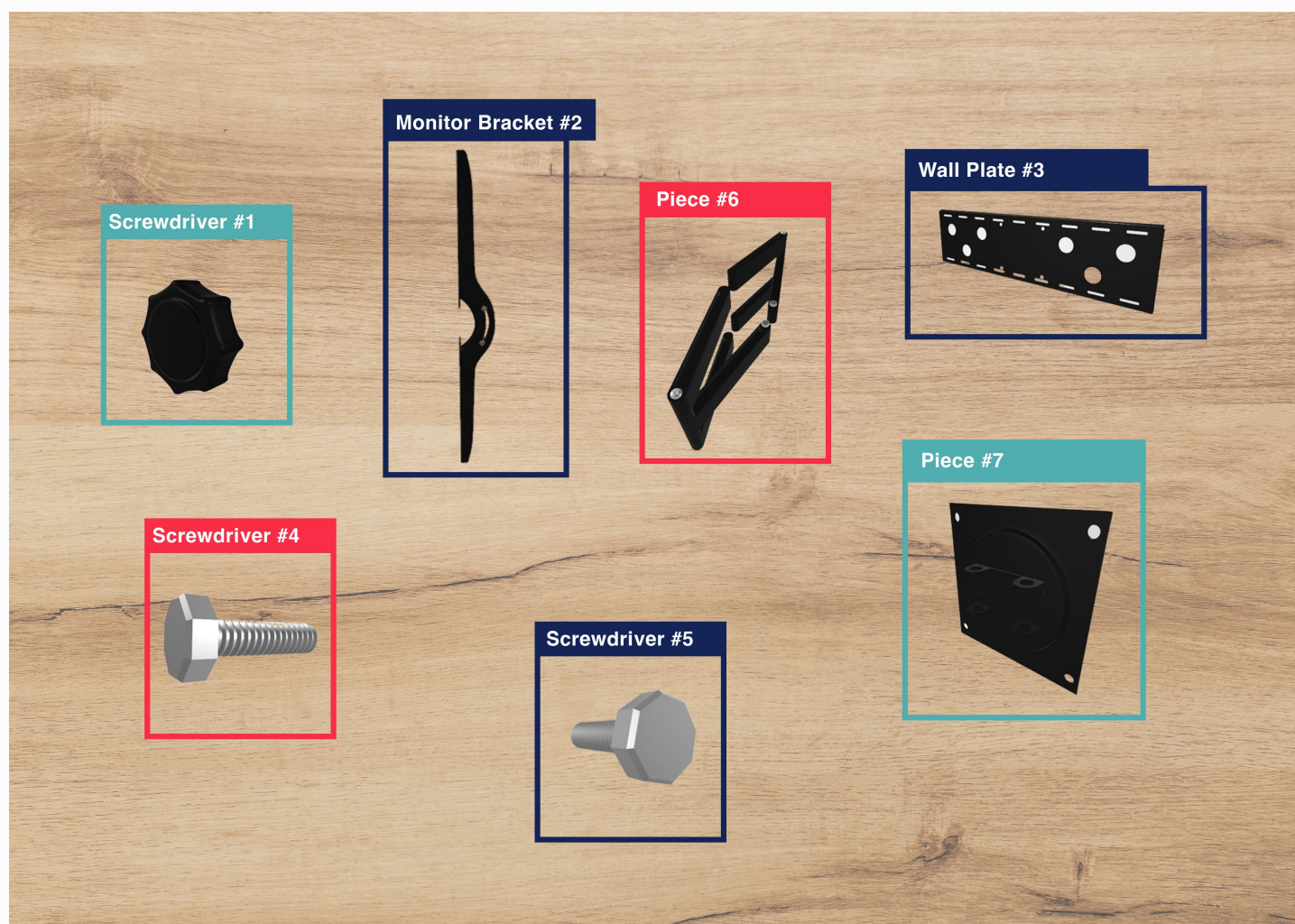


Figure 1

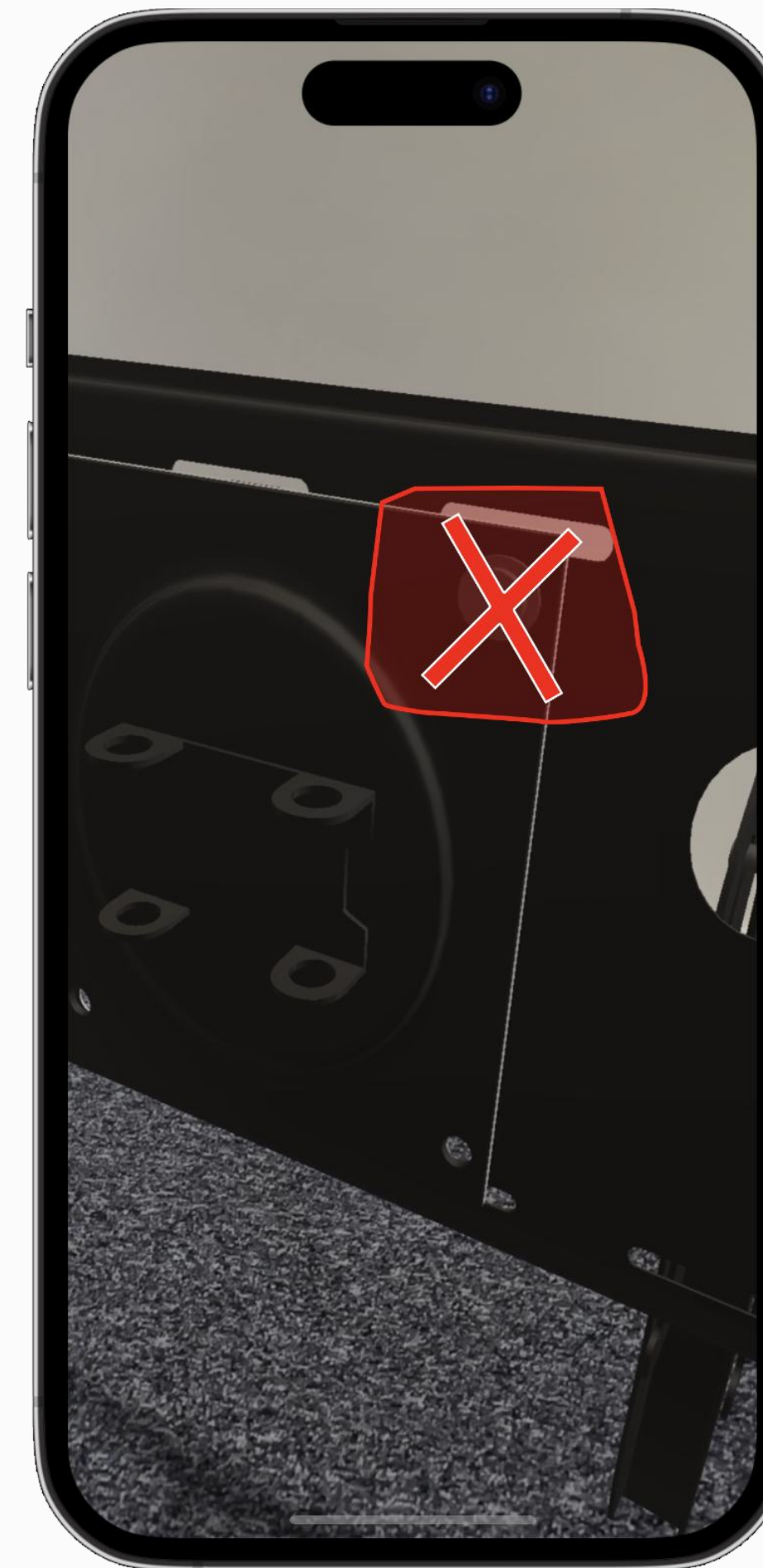


Figure 2

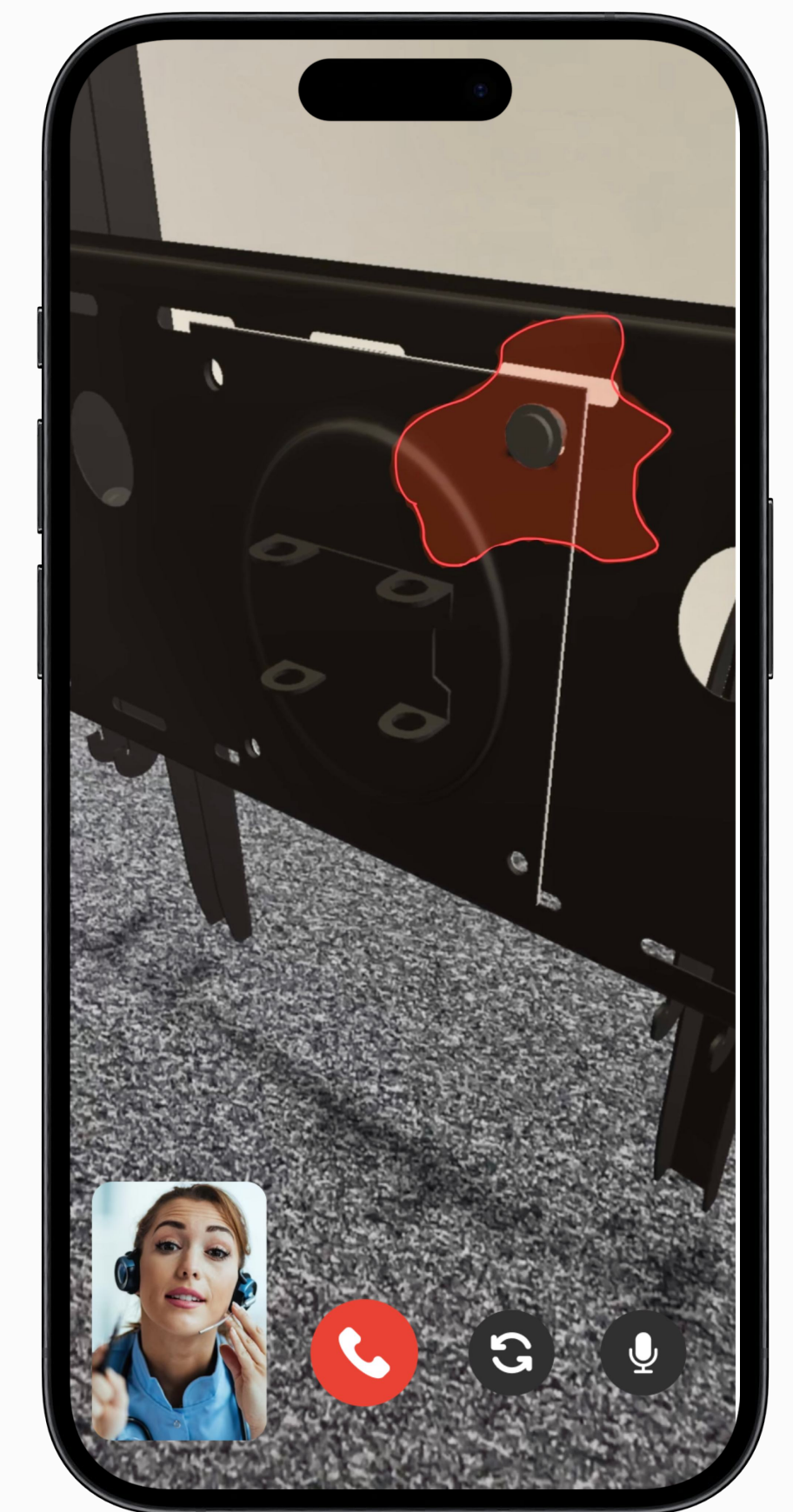
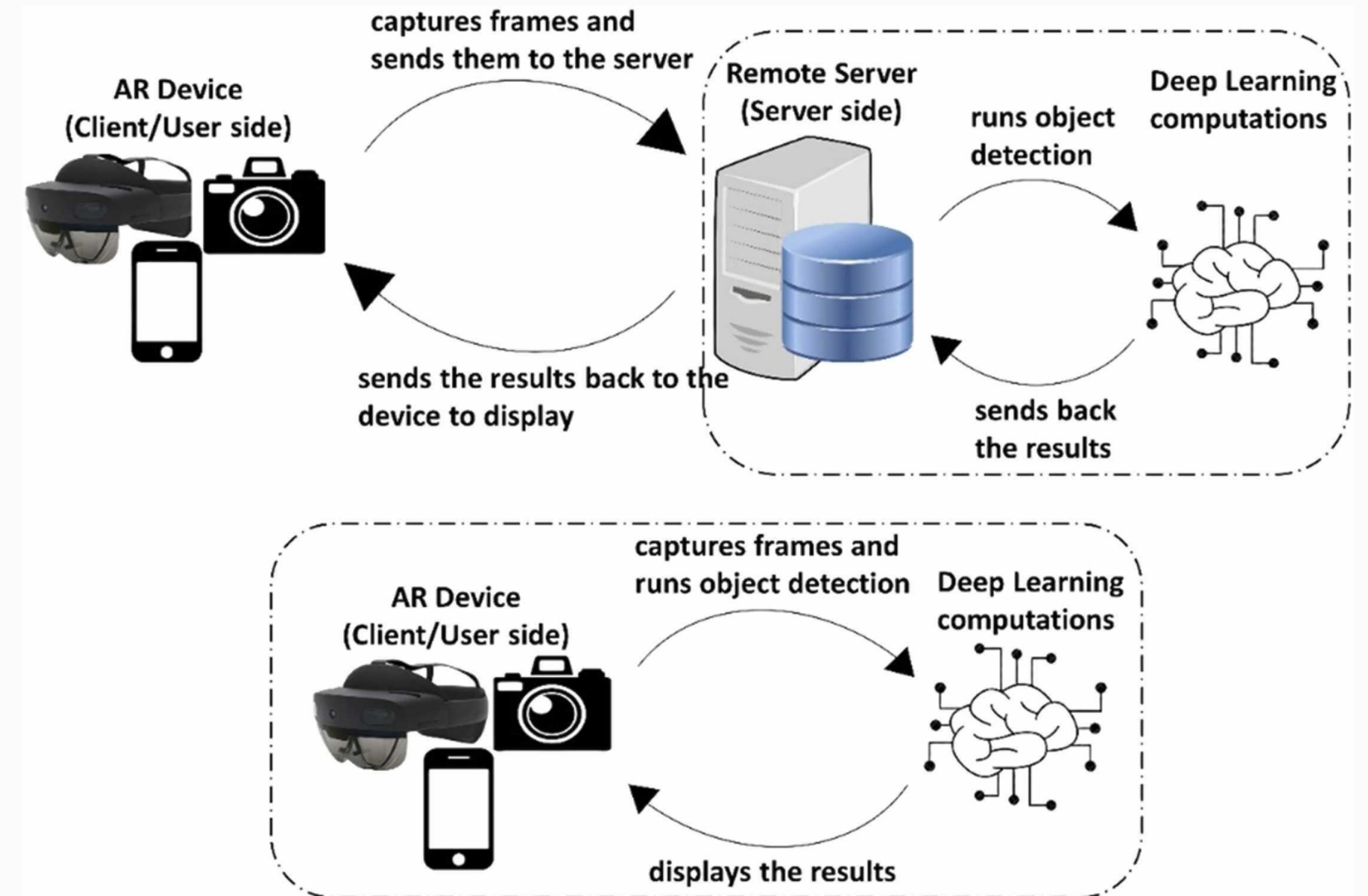


Figure 3

Features Definition- Object Recognition

For object recognition, we use a faster R-CNN algorithm. Mobile devices capture images of objects and assembly models, both correct and incorrect, using a depth camera sensor. These images are sent to a server for processing. Results are then displayed on the mobile device, linked to a database of stored object detections, and can be viewed through a 3D lenslet array case. This setup allows the application to function on devices with lower specifications by leveraging 3D integral imaging.



Two Processes Of The Object Detection Computation: (A) Remote Server-Based Process, (B) Local Device-Based Process.

Features Definition- Safety

In order to keep users safe when they are putting up a product, we explored implementing one function that would make use of the Internet of Things (IOT) to alert users to potentially dangerous heating surfaces. for example, when people work with a drill, it gets warm and poses a risk of injury to them.

By utilizing an **IR sensor**, we are able to provide users with information regarding warm surfaces.



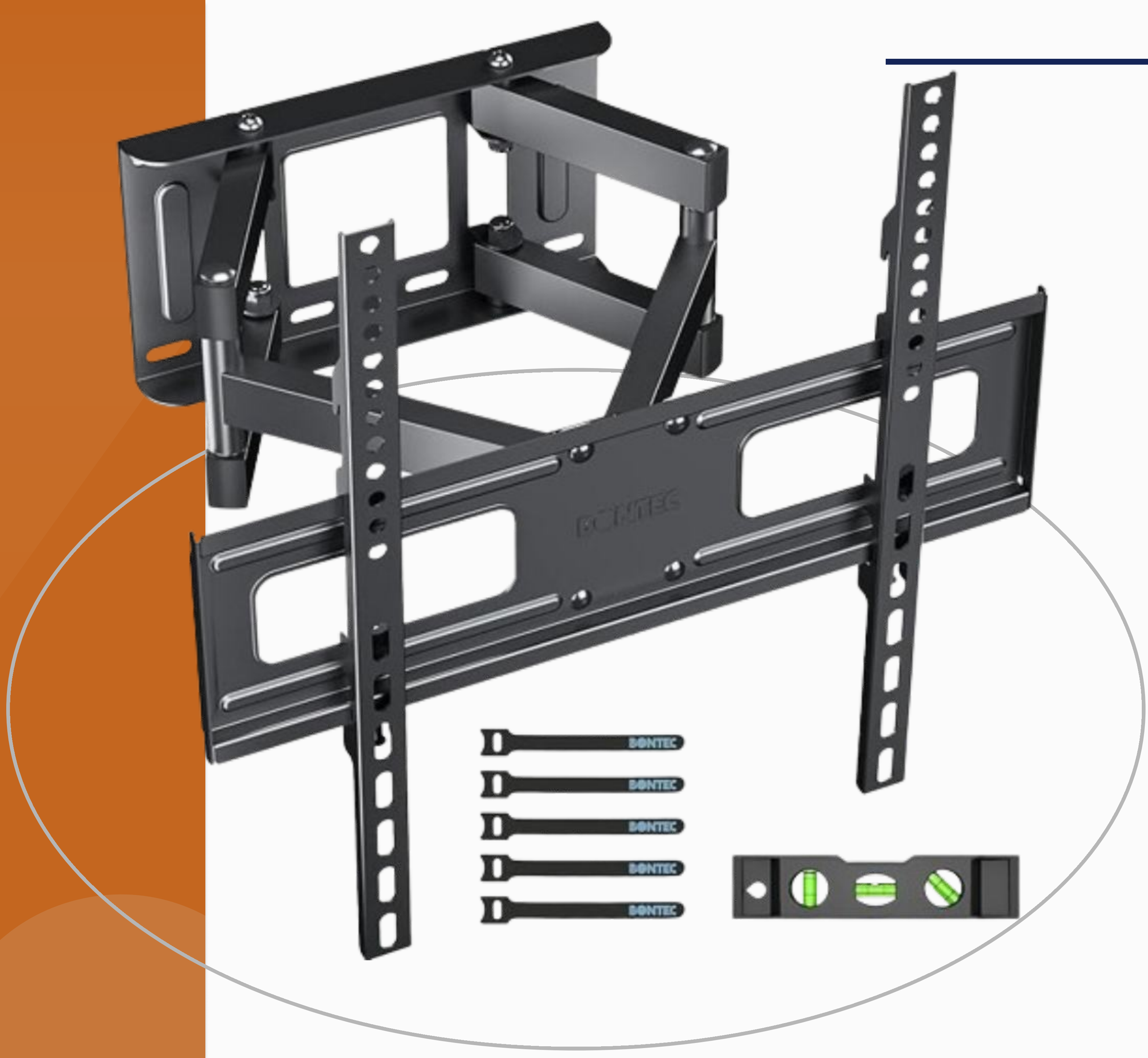
Evaluation

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Test

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Findings

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Modifications

—
Future Enhancements



Testing

We conducted a moderated usability test with eight participants—four women and four men from diverse professions like cashier, doctor, and housewife—to refine our application's user interfaces. Held in a controlled environment, participants used the same phone in the same room, providing valuable feedback through a **"Think aloud"** process after signing consent forms and sharing their background. We recorded their reactions and verbal feedback and also collected data using the **Handheld Augmented Reality Usability Scale (HARUS)**. This thorough approach allowed us to pinpoint the application's strengths and weaknesses effectively.



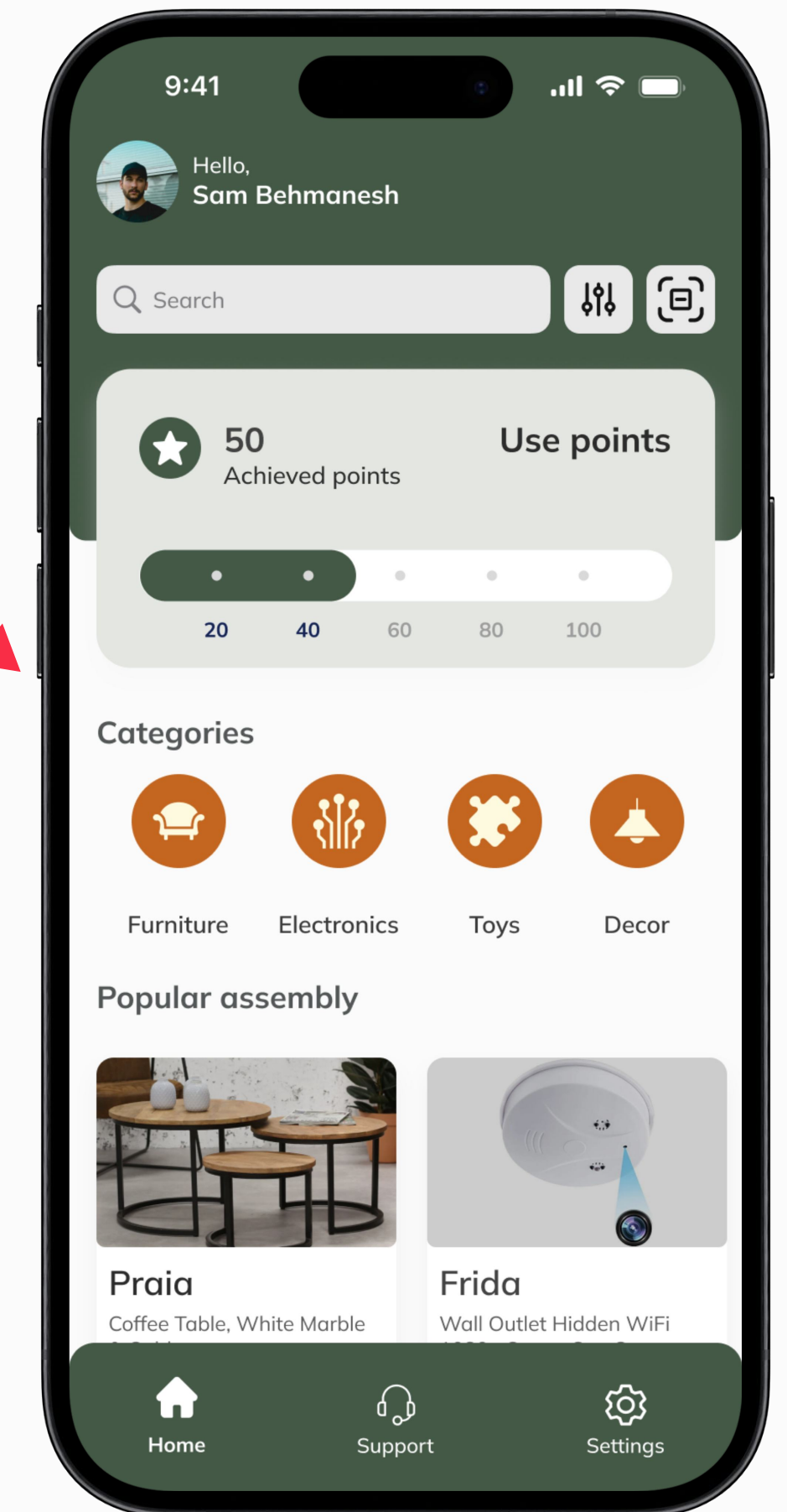
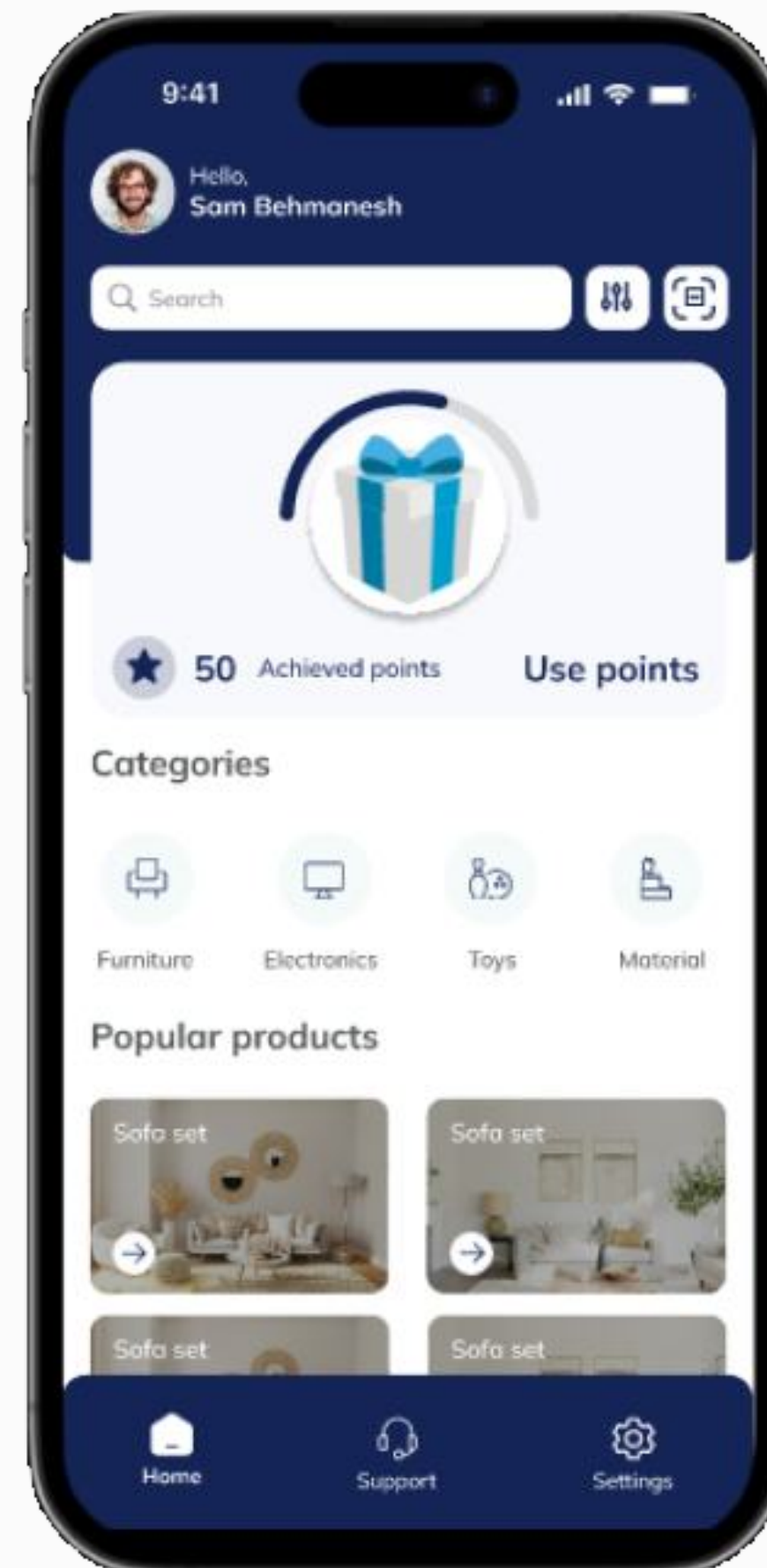
Findings

Quantitative data was result of Handheld Augmented Reality usability scale test(HARUS). The total average score of HARUS questionnaire was **86.95** which shows users had positive experience though the application with out major usability issue. Qualitative data was gathered by users comments and thoughts through the flow of doing the tasks and brought more insights into what aspects of this application needs improvements and which sides already work well.



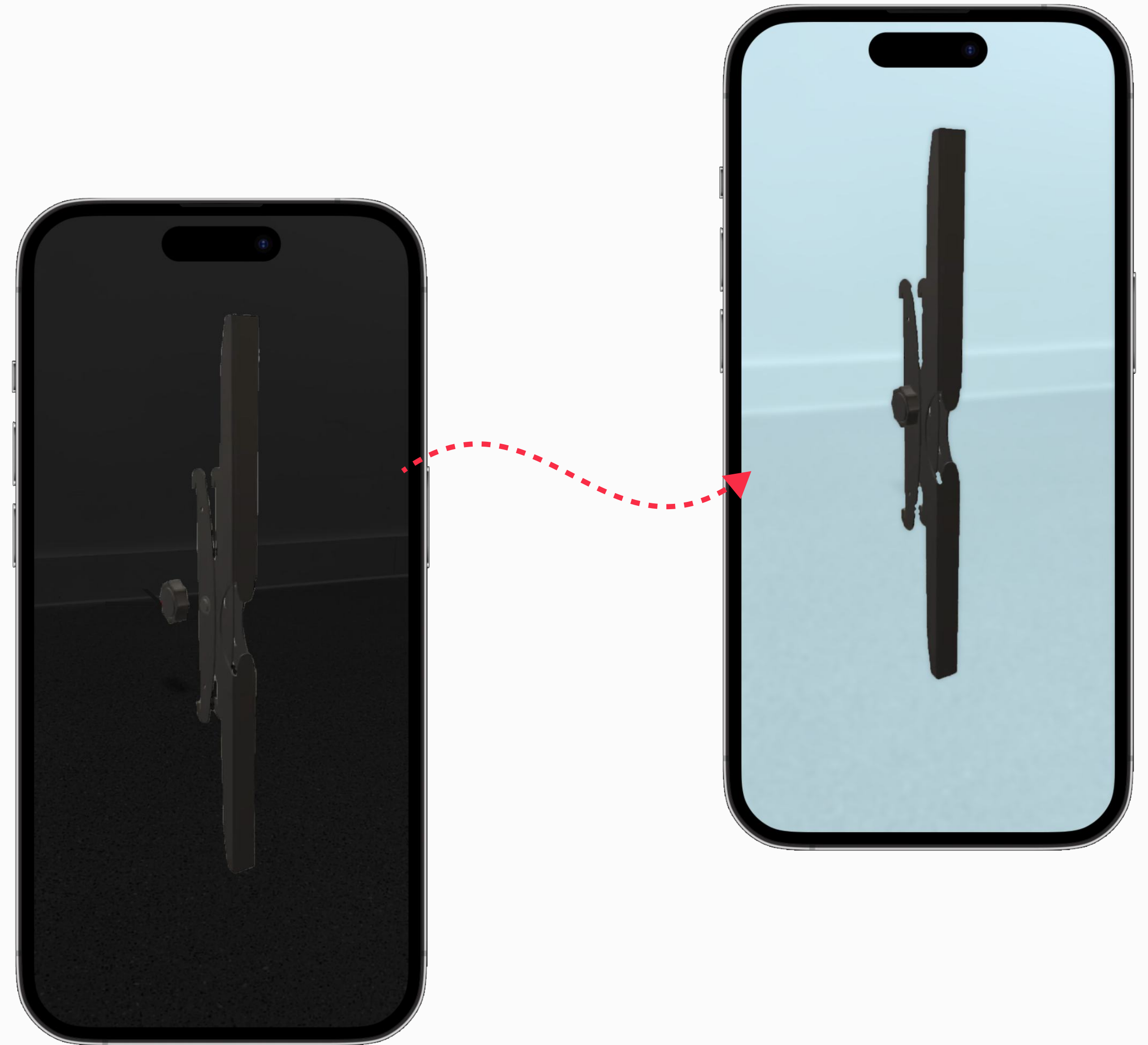
Modification One

To enhance focus on assembly tasks, we've updated our color palette to neutral tones. This change came after feedback from a participant with ADHD, who found the home page animations distracting. We've replaced the animated badges with a static design to minimize distractions.



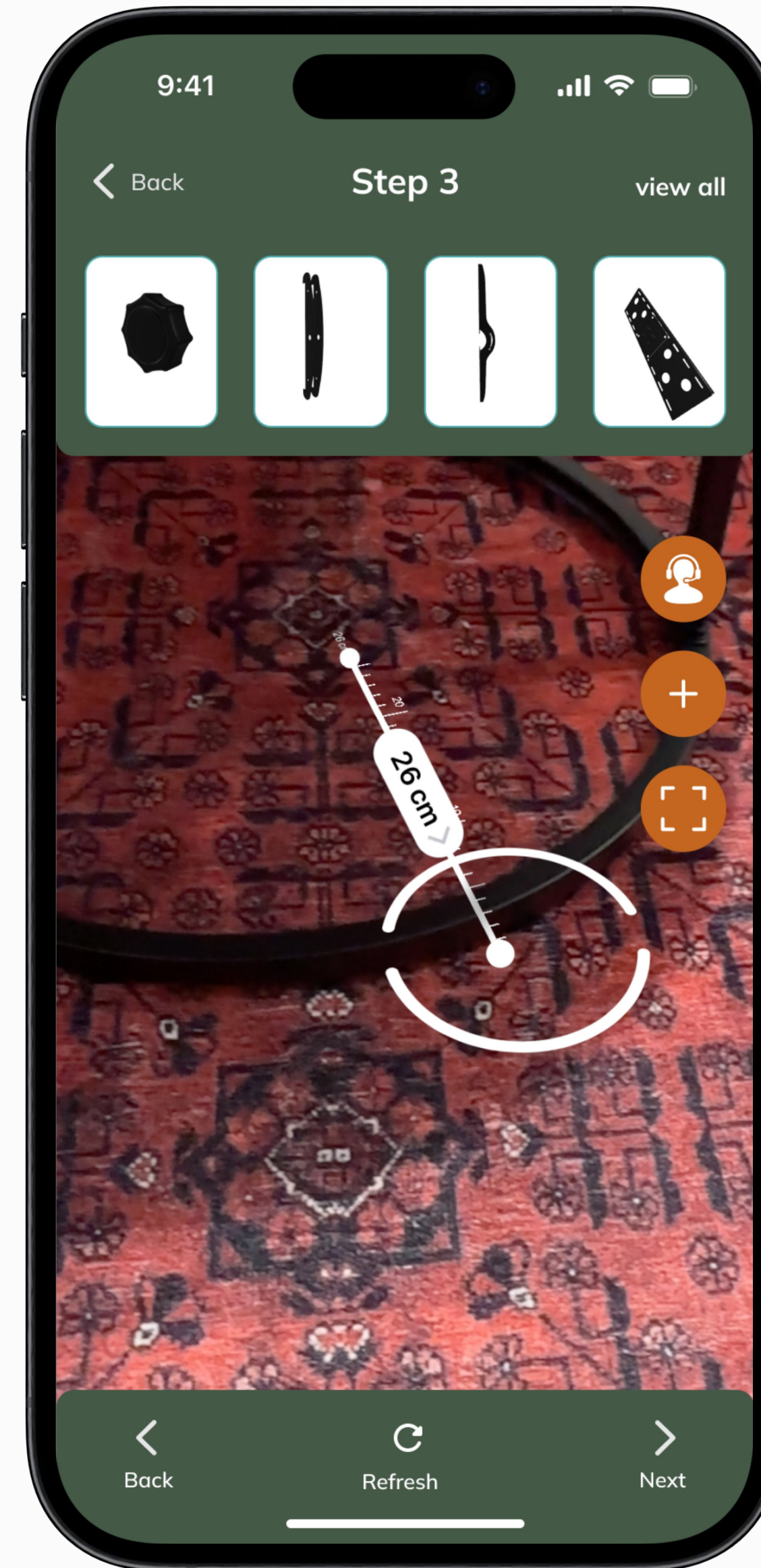
Modification Two

To improve visibility, we've allowed users to change the background color in the app when it matches the product color, as two participants struggled to distinguish assembly details in such scenarios.



Modification Three

Addressing feedback from two participants, we're adding a digital measuring feature to our app, allowing users to easily ensure product dimensions fit their space before and during assembly, enhancing accuracy and convenience without the need for manual measuring.



Future Consideration

1. Multi-Language Support
2. Offline Mode
3. Gamification Elements
4. Accessibility Features
5. Enhanced Security Features

