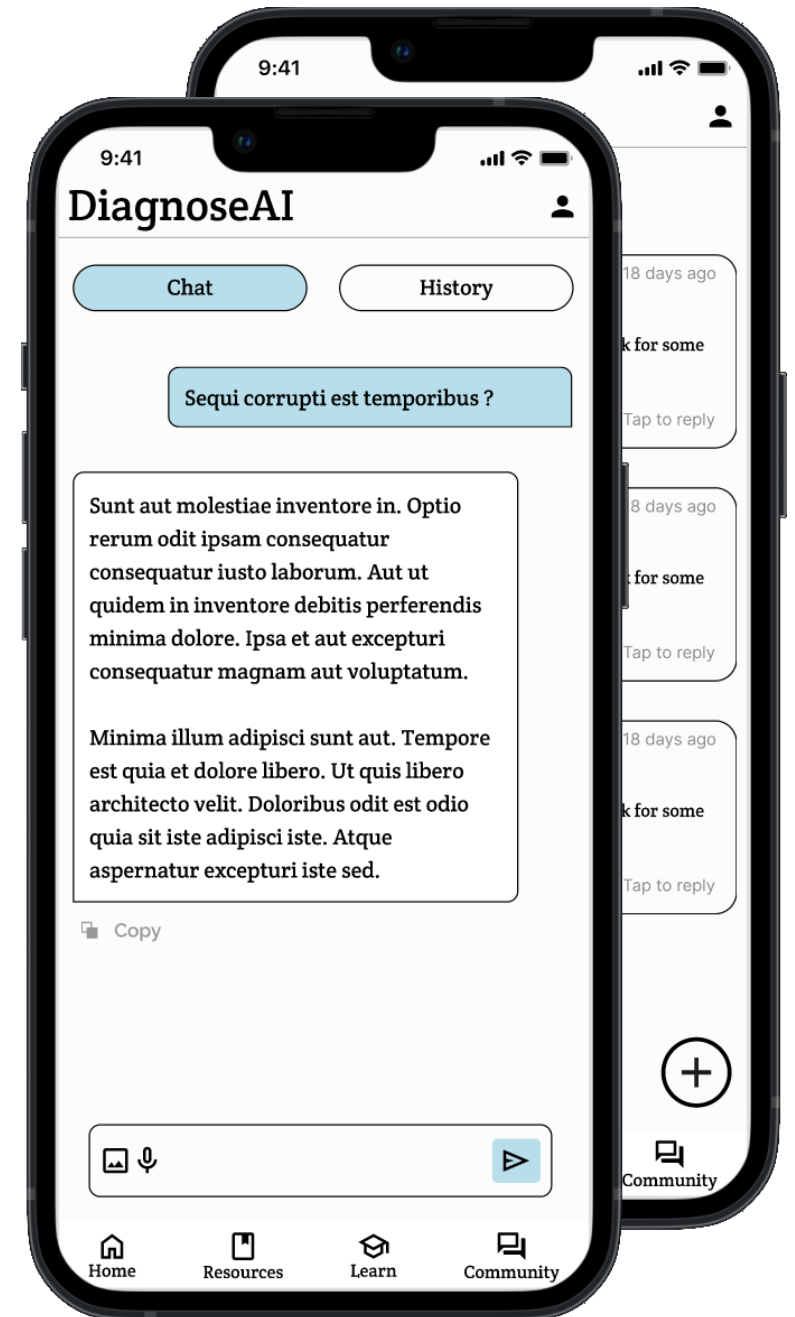


DIAGNOSE AI

'daɪəgnəʊz ai | noun

An end-to-end AI technical assistant platform to
diagnose, repair, and share solutions to engineering
problems

Team 4 – Goerge Ghetiu, Aadhik Easwar, James Lim



GATHERING DATA - METHODOLOGY

Preliminary discovery with the client: Users can be many types of field engineers.

The following types of field engineers were chosen for interviews, as they were accessible

- Utilities Engineer
- Server Technician

FOCUS GROUPS

- Advantages
 - Collect *important* viewpoints from different types of field engineers as quickly as possible
- Disadvantages
 - Can only collect prominent features; resulting product may not be useful to everybody
 - Need many people to form focus groups

SEMI-STRUCTURED INTERVIEW

- Advantages
 - Explore issues in-depth, helps in gathering deeper insights
 - Works with a smaller pool of research subjects
- Disadvantages
 - Interviewer might have interviewer bias

GATHERING DATA – SEMI-STRUCTURED INTERVIEW

Semi-structured interviews were used to explore issues in-depth and gather deeper insights (Preece et al., 2015). The following images show snippets of the interview questions asked, recorded with the manual note taking.

Do you ever run into problems in your job where you are unsure on how to proceed?

- Yes
- Deals with many types of machines
 - Heating
 - Air conditioning
 - Ventilation
 - etc
- Machines have different models
- New models release all the time
- Can't know everything

What do you do when you run into such problems?

- Call up colleagues
- Also tries researching it online
- Prefers calling colleagues over searching

Do you think a remote-support AI assistant can help you out with the same?

- Interested but skeptical

What type of features would you want the assistant to have?

- Want to have hands-free interface
- Want tool to help as a reference
- If tool was solutions & diagnosis tool, would take up too much

Utilities Engineer (Male, 35)

What does a day in the life of a server technician consist of?

For the most part it involves routine work like software updates, security checks, backups and software patches. However, there are often situations where she needs to handle server outages.

What do you do when a server outage occurs?

During server outages, she first tries and handle the issue herself. However, she often has to search for solutions online, such as google and watching videos. That involves filtering a lot of the information up my seniors and ask for their expertise.

Are these methods effective at handling the outages?

No, In fact they're quite ineffective. During server outages, the research through online information takes time and could suggest insecure solutions they are often unavailable when she contact them, which further delays the issue.

Would you be open to an AI assistant to help handle server outages?

She would be very excited to use AI in server troubleshooting. She would firstly like to have a tool that can solve server outage issues remotely. In addition, she would want some kind of a command line interface that is easy to use and clear. She mentions that solving the problem using a command line interface is tricky and she often need help finding the right commands.

Server Technician
(Female, 27)

If you would like your contact details to be retained so that you can be contacted in the future by UCL researchers who would like to invite you to participate in follow up studies to this project, or in future studies of a similar nature, please tick the appropriate box below.	
<input type="checkbox"/> Yes	<input type="checkbox"/> No
Name of participant	
Date	
Signature	
Name of participant	
Date	
Signature	

Consent Forms

PERSONAS & SCENARIOS

After the interviews, the data was aggregated together, and the team formed personas of target users to share a common reference of the users among stakeholders (Affairs, 2013).

Cain (27, F) the Server Technician

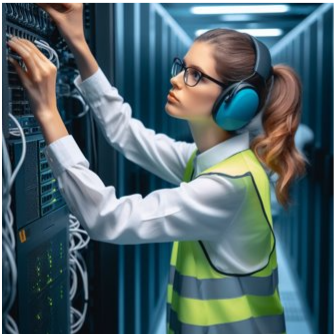


Image credit: Bing Chat DALL-E

“I enable Netflix & chill”

Cain has a Bachelor's degree in Information Technology, has attained several certifications mandated by her company's policy. A keen problem-solver and tech enthusiast, she has been in the industry for 4 years, with her focus area being server maintenance and troubleshooting production incidents.

When she encounters difficulties in her role, she looks up Google or watch YouTube tutorials; if she is pressed for time, or something escapes her comprehension, she contacts her colleagues for help.

She often laments the challenges of dealing with aging infrastructure, and wishes for more uniformity in server setups.

Motivations

- Passionate about technology and likes to keep herself up to date
- Enjoys her role in maintaining business continuity
- Enjoys working in fast-paced environments, where every minute of downtime matters

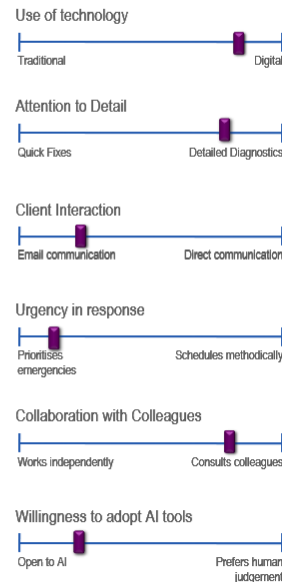
Goals

- Company KPIs: minimize server downtime, fast recovery, server reliability and up-to-date security practices
- Stay updated with latest industrial trends to hit KPIs
- Remote work (also leads to faster responses)

Pain points

- High pressure and stress, each maintenance task affects server uptime and performance
- Time invested to keep up with tech
- Colleagues may not be available when assistance is required
- Maintaining legacy systems (requires old knowledge)

Behaviours



ThoughtWorks®

Able (35, M) the Utilities Engineer



Image credit: Bing Chat DALL-E

“Keeping Your Heat Steady, Every Day!”

Able has 5 years of experience as a utilities technician. He has acquired the essential set of heating, ventilation and air conditioning certifications required to do his job effectively. He is expected to be qualified to maintain machines for company clients such as boilers, pipes, and any relevant electrical wiring. He works with machines in awkward positions and may require the use of personal protection equipment (PPE).

While a competent engineer, he sometimes encounters situations he has never seen before. To this end, he contacts his colleagues for help. However, because of the company's high turnover rate, which leads to brain drain, he finds himself contacting multiple people to get the job done. He is hence unable to perform his job effectively and efficiently.

Motivations

- Financial stability
- Likes to diagnose and solve problems
- Likes to learn about new technologies
- Gratitude & satisfaction from customers

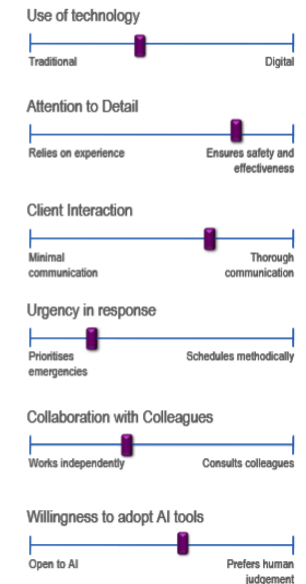
Goals

- Earn higher pay: gain credibility to take on more work
- Hit Company KPIs to earn credibility: Customer Satisfaction surveys, response time, completion time, first-attempt fix rate, 0 safety incidents
- Reduce need to contact colleagues, as they may not always be available

Pain points

- Sometimes cannot avoid contacting colleagues; too many technologies to maintain to know it all
- Outdated manuals & documentation
- Improper diagnosis leads to longer repair times and cost
- Awkward placement of machinery & PPEs inhibits possible product & solutions

Behaviours



ThoughtWorks®

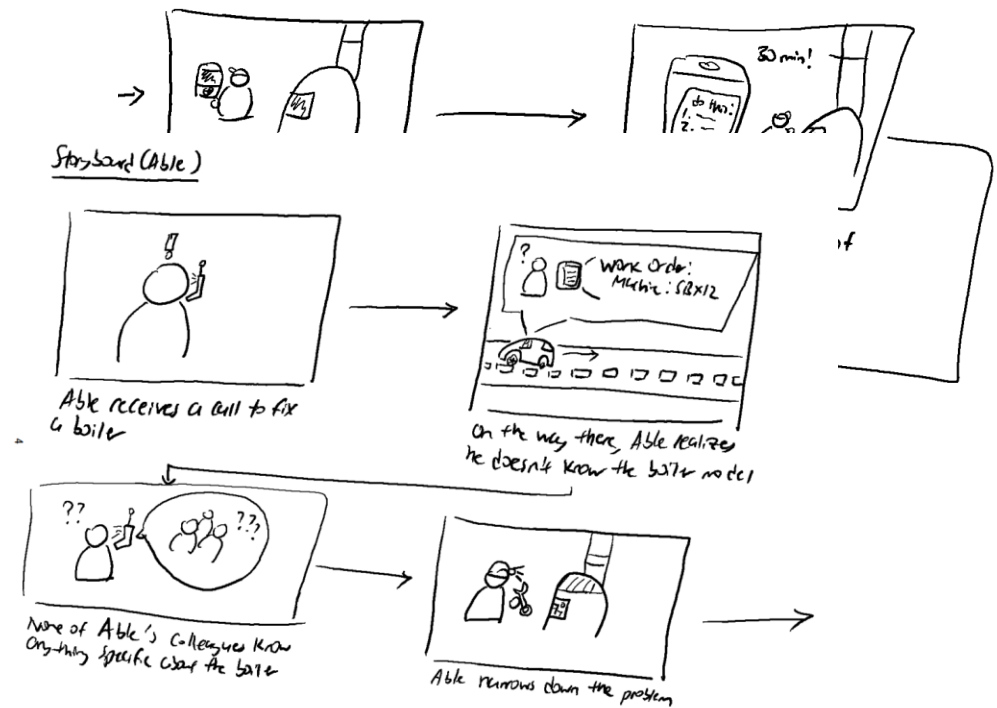
PERSONAS & SCENARIOS

The team also produced some scenarios and drew storyboards for them. After showing them to the users, they agreed that with some minor changes, the product will help them.

"Able, a utilities engineer, got a call early on a brisk morning to repair a family's boiler that had left them without heat for a day. Heading to the job, he **realised the boiler model was new to him**. Despite reaching out, his colleagues were also unfamiliar with it. Usually, this means **he would have to take multiple sessions** to service the machine. Undeterred, Able decided to test our app for assistance.

Arriving on site, he suited up in his PPE (Personal Protection Equipment) and, drawing on his experience, pinpointed the likely malfunctioning part. To avoid a lengthy repair process, he opened our app and took a photo of the component in question. The app quickly analyzed the image, diagnosed the issue, and provided clear, step-by-step instructions for the repair.

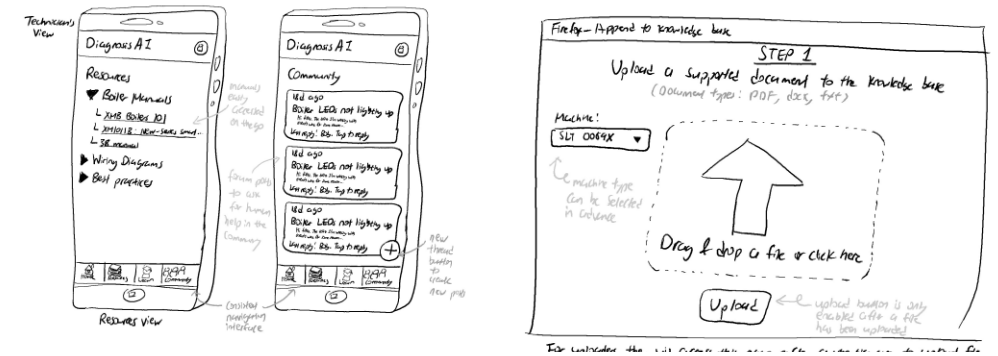
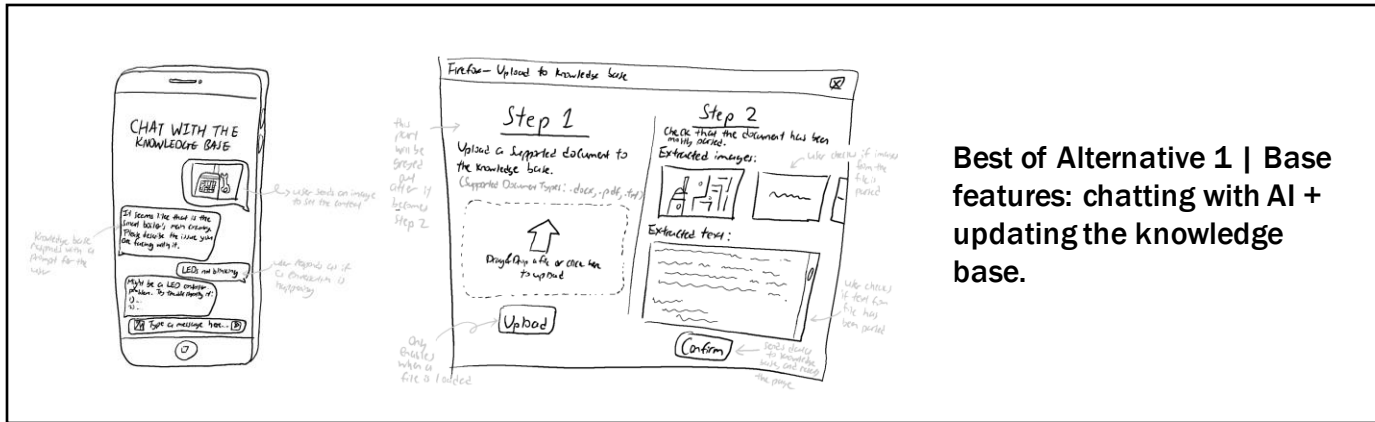
Following the app's guidance, Able not only fixed the boiler efficiently but also learned about its specific design and operation, enhancing his expertise. The boiler was repaired in significantly less time, to the family's relief and gratitude, thanks to the app's help".



Illustrated: Storyboard for Able

SKETCHES

Through iterative refinements of scenarios and storyboards, the team developed user-informed sketches. Three design alternatives were validated with user feedback, allowing for the integration of the most effective features into the final product iteration, thereby closely aligning with user's needs.

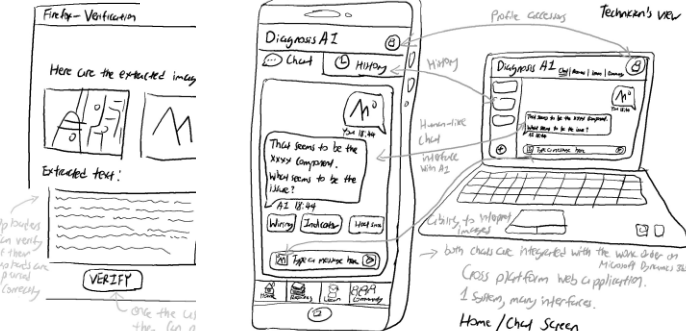


Best of Alternative 2 | Authentication + Voice.

Users mentioned it would be nice to have all the uploaded technical manuals at hand, in case they need to reference them.



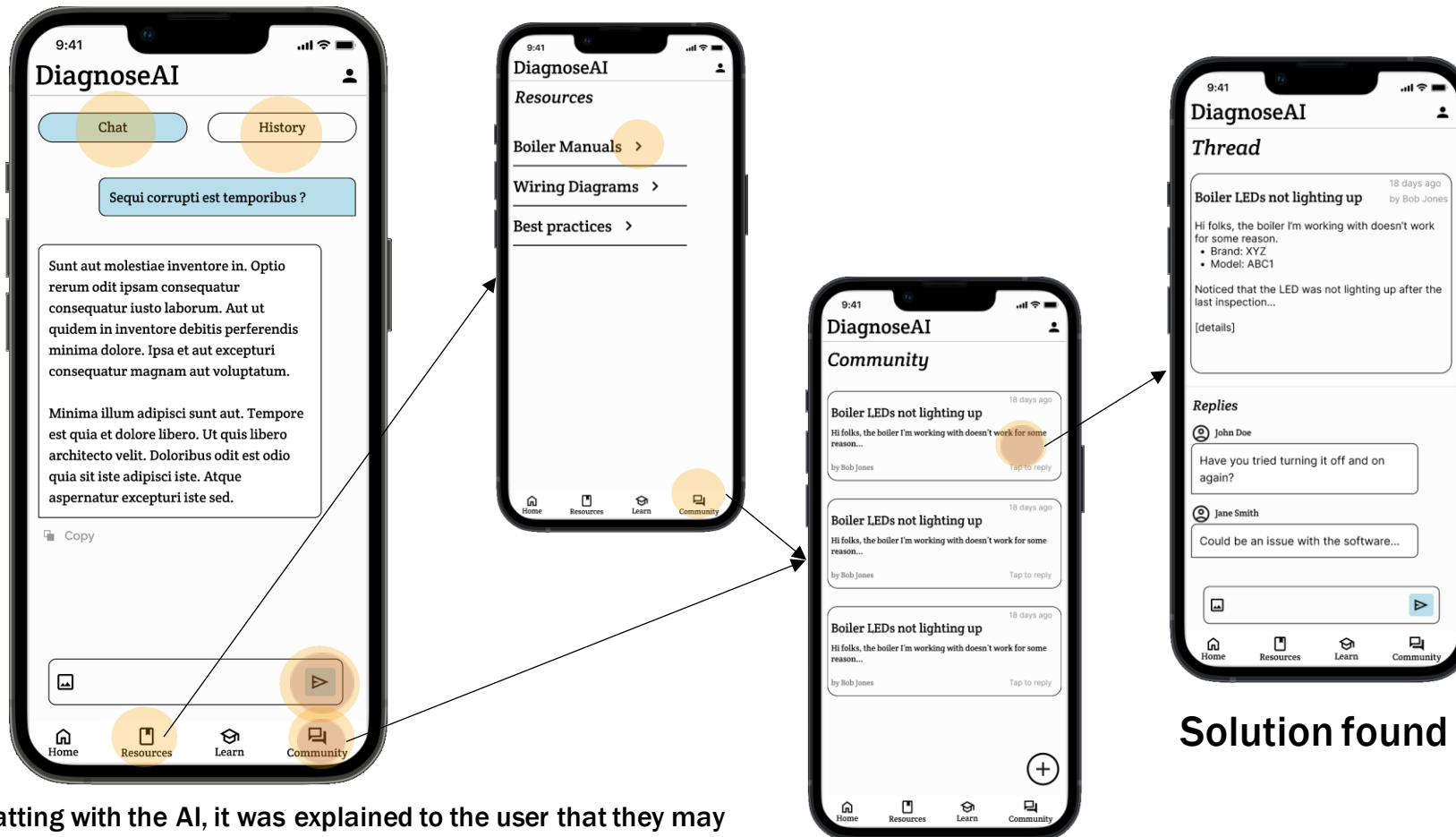
Best of Alternative 3 | Community & Technical Resources



Final iteration

PROTOTYPE - ENGINEER

The interactive prototype, built in Figma, was then evaluated against users. The heatmaps below (yellow to red, where red shows the most interaction) illustrates the user's interaction observed during field evaluation. The user was asked to "find a way to fix LED controllers on a boiler".



After chatting with the AI, it was explained to the user that they may not get a useful response. The observer then gave a follow up question: "What would you do if the AI didn't give a good response?"

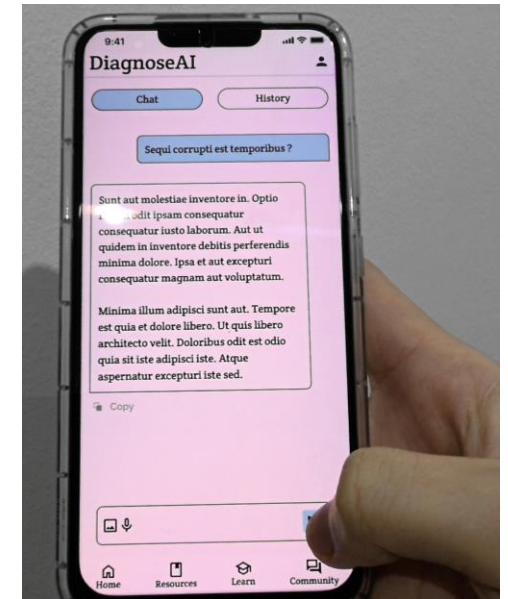
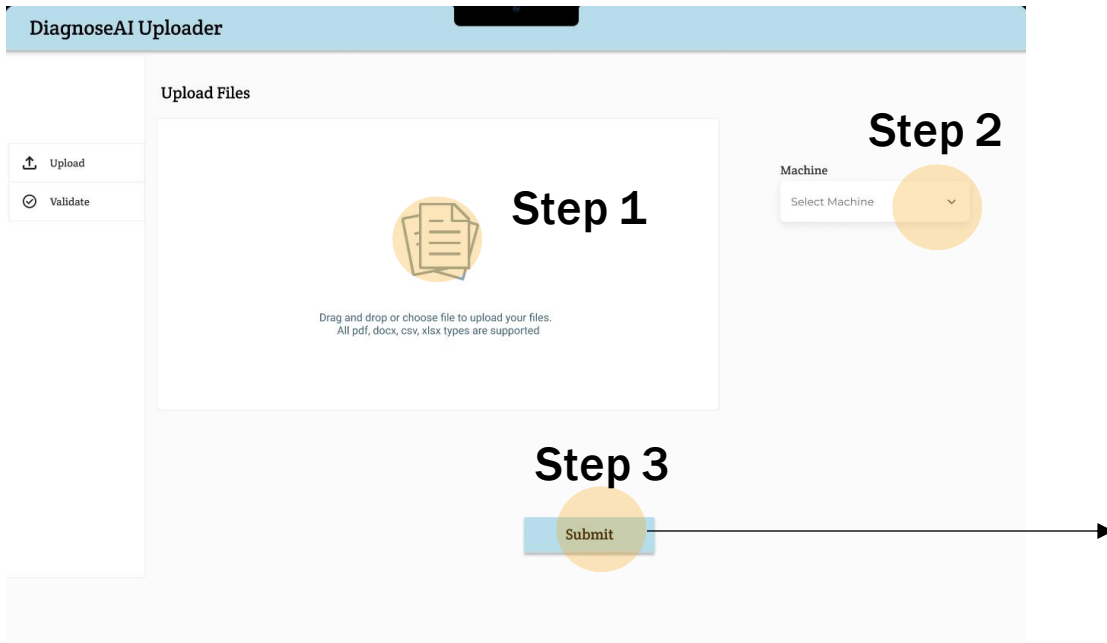


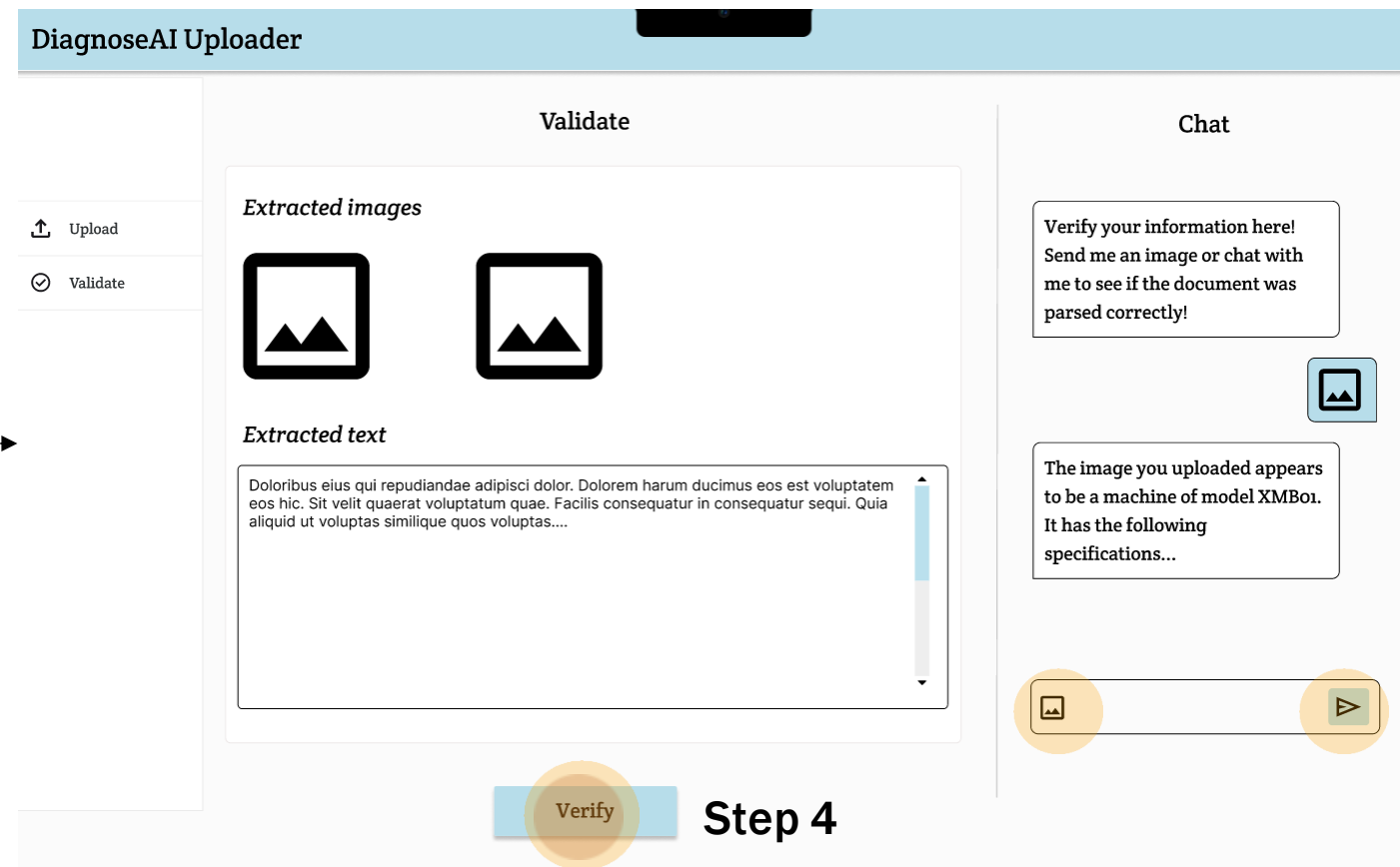
Figure: One such user interacting with the Figma prototype

PROTOTYPE - UPLOADER



Most of the users were able to complete the tasks with little-to-no difficulty. However, we note some usability issues after studying their interactions with our prototype.

Prompt: “Upload a PDF and verify if the contents are uploaded correctly”

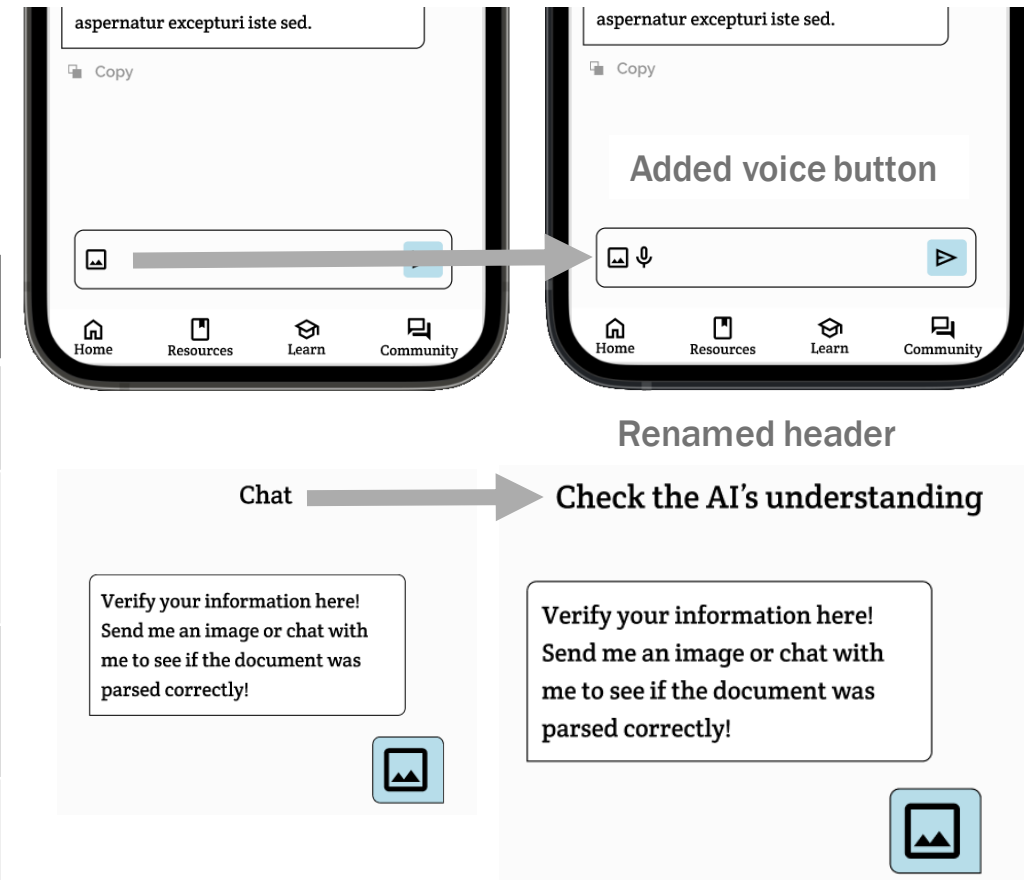


EVALUATION AND UPDATES

According to volume 33 of the Communication of the ACM Journal on improving human-computer dialogue (Molich et al., 2019), an interface should:

- Speak the user's language
- Provide clearly marked exits
- Provide shortcuts

The above points were used in the evaluation and checked against field observations.



REFERENCES

1. Affairs, A.S. for P. (2013) *Personas, Usability.gov*. Available at: <https://www.usability.gov/how-to-and-tools/methods/personas.html> (Accessed: 05 November 2023).
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3. Preece, J., Sharp, H., & Rogers, Y 2015. Interaction design: beyond human-computer interaction. 4th ed. West Sussex: Wiley.