Handy Lingua

Design Thinking Report
Project Video link: https://youtu.be/NM0VRr5gmQI

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1.0 INTRODUCTION

Nowadays, people with disabilities that include hearing and speaking problems are often stereotyped because of their deficiency. Many of them live an unfortunate life because of this, because people can not understand them very well. Just imagine, how many people have faced injustice just because they can not talk or hear very well.

We as educated people must have empathy and consider learning sign language. Although there are many ways to learn it, either from Youtube, Google or even apps, we still do not have time to learn it due to our work or studies. Besides, this learning process takes time and sometimes we can not implement what we study into a real life situation.

This problem keeps repeating again and again without a solution. This makes most of us give up on understanding and chatting with people with hearing and speaking disabilities. This also makes them feel insecure and does not know their potential to improve themselves because they can not reach for help from others.

2.0 PROBLEM STATEMENT

Based on statistic of Department of Social Welfare of Malaysian, until 31 January 2023, there is 3,397 people in Malaysia have speaking disabilities and up to 42,652 Malaysian have disabilities with hearing and most of them are men. The data of UNHS in KKM also showed a significant amount of 4 out of 1000 newborn babies have hearing disabilities .The numbers keep updating as the months go on.

Most of them are using sign language to communicate with other people, but unfortunately, not everyone has time to learn sign language and think that it's a nuances to learn it ,just to communicate with them. They usually do not have many friends and have difficulties learning in normal class like other students and also difficult for them to have a decent job to support their life due to lack of communication. This makes most of them decide to work alone or more unfortunate, can not work at all.

Everyone has a chance to choose what they want, despite their disabilities. This shows an incredible injustice to them just because they cannot communicate normally like others. With the rise of technologies and AI tools, we can create some new inventions or technologies to help them communicate. A free to download apps that can change their life 360 degrees.

3.0 DETAILED DESCRIPTION

3.1 CASE STUDY

To gain a deeper understanding of the communication challenges faced by deaf, mute, and non-disabled individuals interacting with each other, our team conducted a survey using a Google Form. The primary goal was to gather insights regarding user experiences, preferences and potential interest in *Handy Lingua*, even from those who had never used a similar app before.

Project Overview

To ensure that *Handy Lingua* meets the needs of its intended users—individuals who are deaf or mute, we began by researching existing solutions in assistive technology and sign language apps. This provided valuable context on areas for improvement and common issues users face.

Existing Sign Language Apps

We reviewed popular sign language apps, including The ASL App, SignSchool, and iASL, to identify features and gaps in current offerings. While these apps are valuable for learning sign language, many focus primarily on educational aspects. Communication features, especially real-time translation services for sign language gestures into text, remain underdeveloped. Some apps use video libraries to demonstrate signs, but they lack real-time responsiveness which is one of the key features envisioned for *Handy Lingua*.

Accessibility and Inclusivity

Research into accessibility for people with disabilities highlighted the importance of intuitive and user-friendly design. A study by the World Health Organization (WHO) emphasized that communication remains a significant barrier for individuals with hearing and speech impairments, particularly in social and professional contexts.

Apps and technologies must be easy to navigate and designed with accessibility at their core. Despite attempts to provide real-time translation services, current apps often fall short in delivering accurate, seamless user experiences. Users need quick responses and clear feedback, making high recognition accuracy for signs a critical design focus for *Handy Lingua*.

3.2 DATA COLLECTION

3.2.1 INTERVIEW

To better understand the communication challenges faced by both deaf and non-deaf individuals, an interview was conducted with Mr. Vasuthevan, a 57-year-old individual who frequently interacts with deaf individuals, to gain deeper insights into the communication challenges faced by both deaf and non-deaf individuals. Mr. Vasuthevan acknowledged that he has had interactions with individuals who have hearing disabilities. However, these interactions were limited due to a lack of mutual understanding between both parties. He identified the primary communication difficulty as the inability to effectively understand one another during conversations. When questioned about learning sign language, he expressed a positive interest but cited notable challenges, including the complexity of the language and time constraints for learning. Despite these obstacles, Mr. Vasuthevan demonstrated a willingness to use a mobile app designed to overcome such challenges, indicating a potential interest in leveraging technological solutions to enhance communication. This interview provided valuable data on the difficulties faced by non-deaf individuals in interacting with the deaf community and their receptiveness to technology-based interventions.

3.2.2 GOOGLE FORM SURVEY

Gender
23 responses

47.8%

52.2%

● Female
● Male
● Prefer not to say

Age
23 responses

13%

87%

● < 15
● 15-24
● 25-64
● >65
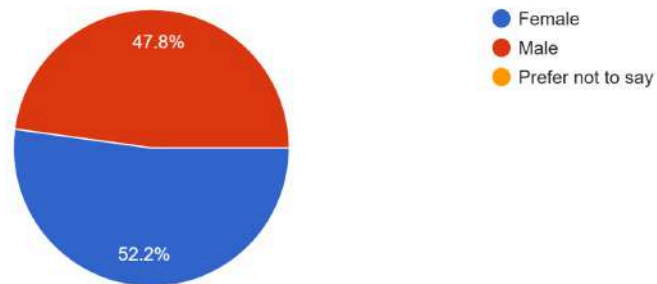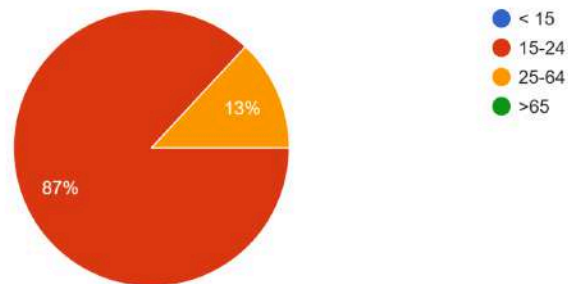
Have you used a sign language app before?
23 responses

73.9%

26.1%

● YES
● NO
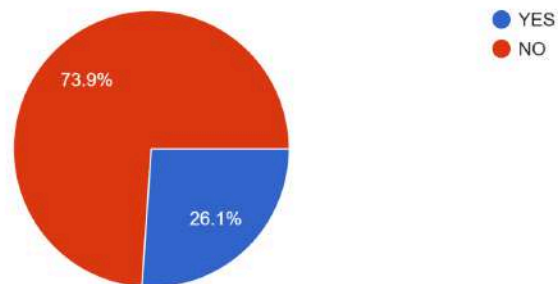
What are the main challenges when communicating with someone who uses sign language?

12 responses

- Not understanding the signs
- Being unsure how to respond
- Difficulty learning or remembering signs
- No difficulties encountered

33.3%

16.7%

50%
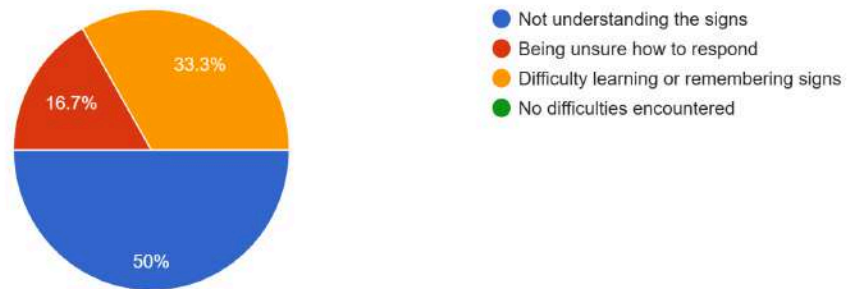
What are the main challenges you face when communicating with non-sign language users?

2 responses

- Lack of understanding from others
- Difficulty expressing myself clearly
- Limited tools to aid real-time communication
- Misinterpretation of signs

33.3%

33.3%

33.3%
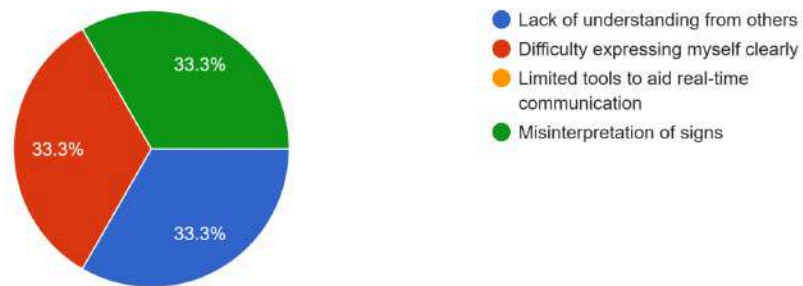
Which feature would be most helpful in a sign language app?

12 responses

Feature	Responses
Tutorials and lessons for learning basic signs	10 (83.3%)
Real-time translation of sign language to text or speech	9 (75%)
A quick reference to basic signs and gestures	7 (58.3%)
An interactive conversation feature for practice	5 (41.7%)
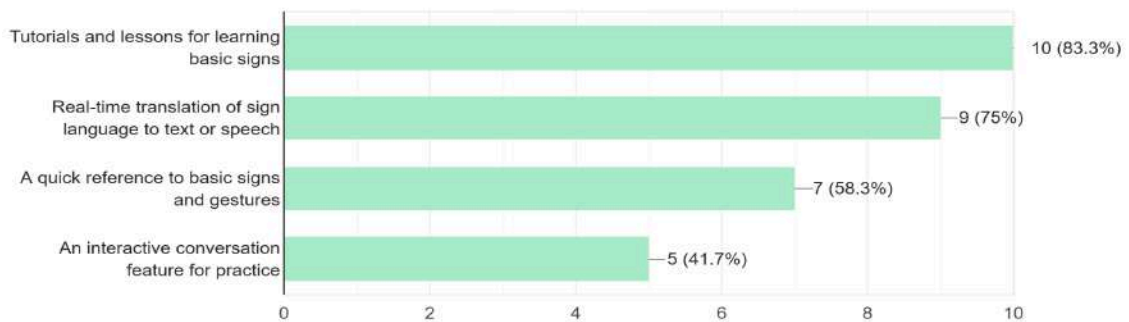
What would you most like to see in a sign language app?

12 responses
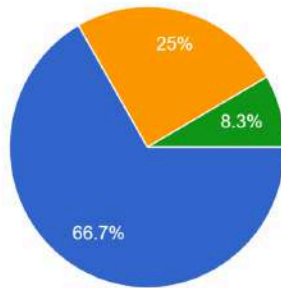
- Enhanced features for real-time communication
- More options for customizing the app's interface
- Offline access for easier use anywhere
- A wide selection of sign language tutorials and resources

25%

8.3%

66.7%

Are you interested in trying our sign language app?

14 responses
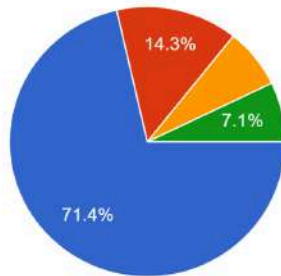
- Yes, I would like to learn sign language and communicate more effectively
- Maybe, I'm curious about how it works
- No, I'm not interested in learning sign language right now
- Option 1

14.3%

7.1%

71.4%

3.3 PROBLEMS AND SOLUTIONS

In developing the Handy Lingua sign language app, several challenges faced by both disabled and non-disabled individuals regarding communication were identified. These challenges include a lack of understanding, difficulty in expressing oneself clearly and limited availability of effective real-time communication tools. The following sections outline the problems and corresponding solutions for each group.

Challenges Faced by Disabled Persons
One significant issue for disabled individuals is the lack of understanding from others. Many deaf or mute individuals experience feelings of isolation and frustration, as non-disabled people often lack familiarity with sign language or the ability to interpret gestures effectively. This communication gap creates barriers that hinder self-expression and interpersonal connections. To address this, the Handy Lingua app will offer beginner-friendly sign language tutorials designed to teach basic signs, promoting inclusive communication between users.

Another challenge is the difficulty disabled individuals face in expressing themselves clearly. Existing tools, such as typing or voice-to-text applications, are frequently unintuitive and lack real-time capabilities. Consequently, signs are often misinterpreted during daily or professional conversations, leading to communication breakdowns. To overcome this, the app will include real-time gesture-to-text recognition and translation features, ensuring seamless and precise communication for deaf or mute users.

Disabled individuals also encounter limited access to tools for real-time communication, which exacerbates their isolation. Text-based solutions often fail to convey immediacy, and literacy barriers can further complicate communication. To address this issue, the app will feature a quick-access sign dictionary, allowing users to quickly reference signs during conversations, enabling smoother interactions without external assistance.

Misinterpretation of signs is another prevalent problem during complex conversations, as non-signers struggle to understand the nuances of gestures. This leads to confusion and ineffective exchanges. To mitigate this, the app will provide conversation guides and contextual prompts, supporting users in engaging in meaningful dialogues even with limited sign language proficiency.

Challenges Faced by Non-Disabled Persons
A common issue for non-disabled individuals is their lack of exposure to sign language, making it challenging to interpret or respond appropriately during interactions with deaf or mute individuals. This unfamiliarity can result in awkward or uncomfortable exchanges. To address this, the app will integrate beginner tutorials to teach essential signs, equipping users with the skills necessary to interact effectively and foster inclusive engagement.

Additionally, hesitation in communication is a significant problem, as many non-disabled individuals are unsure how to participate in conversations involving sign language. This uncertainty leads to reluctance, further complicating communication. To combat this, the app will include conversation guides and contextual prompts to assist users, helping them respond naturally and confidently in real-time interactions.

Another challenge is the difficulty non-disabled individuals face in remembering or learning signs, especially if they do not use sign language regularly. This reduces their ability to engage effectively with deaf users. To address this, the app will provide a quick-access sign dictionary, enabling users to look up forgotten signs or learn new ones during conversations, encouraging consistent engagement.

Lastly, limited resources for communication often hinder the ability of non-disabled individuals to communicate effectively with disabled individuals. Existing tools lack the speed, versatility and interactivity required for meaningful exchanges. To resolve this, the Handy Lingua app will incorporate real-time gesture recognition and translation features, allowing non-disabled users to accurately interpret sign language gestures and communicate meaningfully without prior experience or practice.

3.4 FEATURES OF HANDY LINGUA

Handy Lingua incorporates several innovative features aimed at enhancing communication between deaf or mute individuals and non-deaf users. One of the key features is the Real-Time Sign-to-Text Conversion, which allows hand signs to be instantly translated into text as users perform them. This functionality enables deaf and mute individuals to communicate seamlessly without relying on typed text or third-party interpretation, facilitating real-time conversations. For non-deaf users, this feature provides the ability to understand and respond to sign language users without prior knowledge of sign language, making communication more accessible.

The app also includes Tutorials for Learning Sign Language, offering interactive, step-by-step lessons designed to teach common signs and the basics of signing. These tutorials empower deaf and mute individuals to enhance their signing abilities, promoting inclusivity. Meanwhile, non-deaf users benefit by gaining essential sign language knowledge, enabling them to engage with signers more effectively and fostering a more inclusive environment.

To further support users, the app provides a Sign Language Dictionary containing visual representations and detailed text descriptions for individual signs and words. This feature helps deaf and mute individuals identify and use accurate signs in conversations, ensuring clarity. Non-deaf users can utilize the dictionary as a quick reference tool to look up signs they may not know, allowing for confident and accurate communication.

Another essential feature is the use of Visual Aids such as videos and animations which demonstrate how to perform signs correctly. These aids improve sign accuracy for deaf and mute users, enabling them to express themselves more clearly. For non-deaf users, these visual demonstrations provide valuable support in understanding and reproducing signs effectively, enhancing their ability to communicate with signers.

Lastly, Handy Lingua incorporates Conversation Guides or Prompts that offer context-based conversational aids for various real-life scenarios such as greetings or asking questions. These guides assist deaf and mute individuals by suggesting phrases that help them navigate everyday conversations more easily. For non-deaf users, the guides provide appropriate responses and prompts, ensuring smoother and more natural interactions with sign language users.

Together, these features position Handy Lingua as a comprehensive tool for bridging the communication gap between deaf or mute and non-deaf individuals, fostering inclusivity and mutual understanding.

3.5 TEAMWORK

Effective teamwork played a crucial role in ensuring the successful development of the Handy Lingua app. By leveraging each team member's expertise, promoting clear and regular communication and fostering a collaborative environment, we made significant progress throughout the project. A well-organized workflow, clear task delegation and efficient time management were essential for keeping the project on track. With these approaches, we ensured that tasks were completed on time and to the required standard without sacrificing quality.

To stay adaptive and address challenges promptly, we held regular problem-solving discussions, allowing us to tackle obstacles as they arose. This collaborative approach ensured we maintained momentum and made continuous progress toward our final objective of presenting a functional sign language app.

3.5.1 TASK DISTRIBUTION

Task delegation and time management were fundamental to ensuring a smooth workflow across the various stages of the project. Each team member was assigned specific roles that aligned with their expertise which enabled us to efficiently progress from initial design thinking phases to the final stages of presentation preparation.

Figures 3.5.1 and 3.5.2 present the Gantt chart, which served as a useful tool to track progress and guide our project through its various stages. These charts were essential for maintaining clarity on deadlines, deliverables and the overall project timeline.

Our project spanned from November 10, 2024, to December 26, 2024, covering a period of seven weeks. During this time, tasks were organized and distributed to ensure we met our objectives in each phase of development while also preparing for the final presentation of the Handy Lingua app.

Figure 3.5.1 Gantt Chart
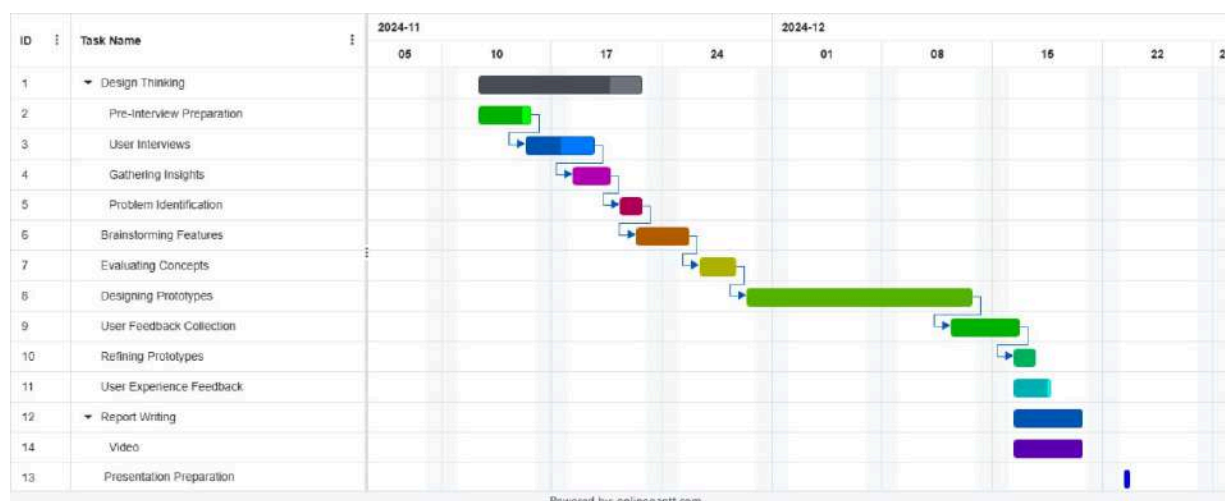
Outline Level	ID	Name	Start	Finish	Duration	% Complete	Predecessors	Resource Names	Color	Notes
1	1	Design Thinking	12/11/2024	22/11/2024	9 day	80				
2	2	Pre-Interview Preparation	12/11/2024	15/11/2024	4 day	80		Fatini,Zariff,qira,sarves,zi ning	121	Researching and brainstorming the challenges of individuals with disabilities to identify key needs.
2	3	User Interviews	15/11/2024	19/11/2024	3 day	50	2FS-1 days	Fatini,Zariff,qira,sarves,zi ning	211	Conducting interviews to gather insights into the challenges faced by disabled and non-disabled users.
2	4	Gathering Insights	18/11/2024	20/11/2024	3 day	100	3FS-2 days	Fatini,Zariff,qira,sarves,zi ning	301	Summarizing data from interviews to identify pain points and opportunities.
2	5	Problem Identification	21/11/2024	22/11/2024	2 day	100	4FS	Fatini,Zariff,qira,sarves,zi ning	331	Identifying key communication barriers faced by target users.
1	6	Brainstorming Features	22/11/2024	25/11/2024	2 day	100	5FS-1 days	Fatini,Zariff,qira,sarves,zi ning	31	<table><tbody><tr><td>Generating potential features such as sign-to-text conversion, tutorials, and a sign dictionary.
1	7	Evaluating Concepts	26/11/2024	28/11/2024	3 day	100	6FS	Fatini,Zariff,qira,sarves,zi ning	61	Assessing which features are most viable and impactful for solving user problems.
1	8	Designing Prototypes	29/11/2024	13/12/2024	11 day	100	7FS	Zariff	91	Creating app wireframes to visually represent key features and workflows.
1	9	User Feedback Collection	12/12/2024	16/12/2024	3 day	100	8FS-2 days	zi ning	121	Collecting feedback on the prototype design from potential users to refine ideas.
1	10	Refining Prototypes	16/12/2024	17/12/2024	2 day	100	9FS-1 days	Zariff	151	Updating the prototype based on user feedback to improve functionality and usability.
1	11	User Experience Feedback	16/12/2024	18/12/2024	3 day	87		zi ning	181	Testing the refined prototype to validate its effectiveness in addressing user challenges.
1	12	Report Writing	16/12/2024	20/12/2024	5 day	99		qira,zi ning	211	Documenting the project, including objectives, methods, findings, and solutions.
2	14	Video	16/12/2024	20/12/2024	5 day	99		Fatini,sarves	271	
1	13	Presentation Preparation	23/12/2024	23/12/2024	1 day	0		Fatini,Zariff,qira,sarves,zi ning	241	Creating a presentation to summarize the project for stakeholders.

Figure 3.5..2 Table for Gantt Chart

In terms of task delegation, we each took on the project using our individual expertise. Below are the details of tasks for each member.

SARVESWARI A/P VASUTHEVAN
She is tasked with making the video for our project, specifically the parts of
I - Design thinking assessment points during the end of the project demonstration and during the transition between design thinking phases
II - Design thinking evidence, providing the sample work to solve the design challenge and record for each phase

NUREEN FATINI BINTI ZULKEFLI
She is tasked with both video and report writing specifically the parts of
Video :
I - Introduction, detailed steps and description in design thinking (Video)
II - Introduction and task for each member (Report)

WONG ZI NING
She is tasked with report writing specifically the parts of
I - Detailed steps and descriptions in design thinking and evidence for each phase
II - Detailed descriptions
III - Design thinking assessment points during the end of the project demonstration and during the transition between design thinking phases

FATIN SYAKIRAH BIN MOHAMMAD HARDON
She is tasked with both video and report writing specifically the parts of
I - Design thinking evidence, the sample work to solve the design challenge and record for each phase
II - Reflections
III - Finalizing and improving the video projects based on the provided rubric

ZARIFF BIN MOHAMMAD AZAM
He is tasked with developing the prototype, specifically to
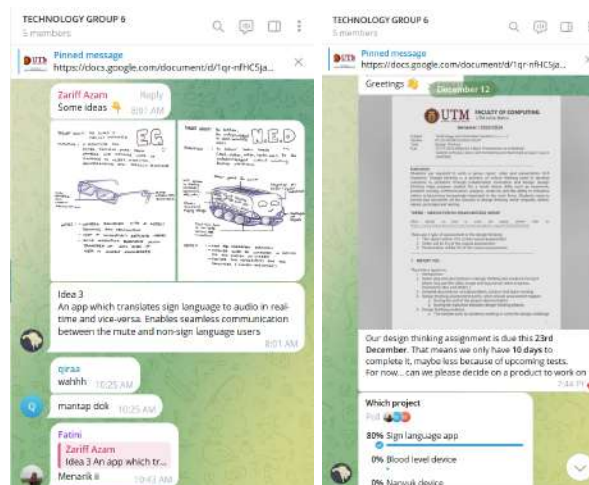I - Design a working prototype
II - Design UI/UX for product
III - Provide mind maps/ flow chart detailing the workflow of the prototype

3.6 KEY AREAS OF TEAM COLLABORATION

Effective team collaboration has been a cornerstone in driving the development and execution of Handy Lingua. The team is composed of individuals with diverse skills spanning design, development and research. Each member leverages their specific expertise to contribute meaningfully toward achieving the project's objectives. This multidisciplinary approach ensures a comprehensive and balanced development process.

To facilitate efficient communication, the team utilizes a range of tools. Google Workspace is used for collaborative document sharing and editing, enabling real-time updates and collective input. Additionally, Telegram serves as the primary platform for instant messaging, allowing team members to maintain seamless and transparent communication, whether for quick updates or detailed discussions.

Task delegation is performed strategically, with assignments made based on the individual strengths of each team member. This ensures that every aspect of the project progresses steadily and effectively, as members are entrusted with responsibilities that align with their competencies. This approach not only optimizes productivity but also fosters accountability within the team.

Adaptability and problem-solving are integral aspects of the team's dynamic. The group remains flexible and open to change when circumstances necessitate a shift in strategy. Challenges are approached collaboratively to ensure diverse perspectives are considered in the process. Constructive feedback is regularly integrated into decision-making to enable the team to identify and implement the most effective solutions to any obstacles encountered.

Overall, these key areas of collaboration which are team composition and roles, communication tools, task delegation and adaptability, all have significantly contributed to the progress and success of the Handy Lingua project.

4.0 DESIGN THINKING ASSESSMENT POINTS

The development of the Handy Lingua sign language app incorporates structured assessment points throughout the design thinking process to ensure that the solution effectively addresses the needs of deaf or mute users and non-deaf users. These evaluations are integral to maintaining a user-centered focus and ensuring the final product delivers impactful solutions to identified communication challenges.

4.1 Assessment During the End of the Project Demonstration

At the conclusion of the project, the concept and prototype of Handy Lingua will undergo a comprehensive demonstration to assess the effectiveness of the proposed solution. The primary focus of this evaluation is to determine whether the app's core features, such as real-time sign-to-text translation and sign language tutorials, effectively address the needs of the target audience, including deaf or mute users and non-deaf individuals. The assessment will emphasize key criteria, such as the usability of the prototype to ensure features are intuitive and easy to navigate, the relevance of the solution in addressing communication barriers identified during the Empathy phase and user feedback from stakeholders and potential users. Insights from this evaluation will guide refinements to the design, ensuring better alignment with user needs and project objectives.

4.2 Assessments During Phase Transitions

Regular evaluations at critical transition points within the design thinking process are essential to ensure the development of Handy Lingua remains aligned with user needs. These assessments provide opportunities to verify the relevance and quality of insights and solutions at each stage.

During the transition from the Empathy phase to the Define phase, assessments focus on verifying whether the primary pain points, such as communication difficulties for deaf users and learning challenges faced by non-signers have been accurately captured. This step ensures the project addresses real and meaningful issues.

In the transition from Ideation to Prototyping, the team evaluates the feasibility and relevance of ideas generated during brainstorming. This ensures that proposed features including the sign language dictionary and real-time sign-to-text translation which are directly aligned with user needs and are technically achievable.

The transition from Prototyping to Testing involves evaluating user interactions with the prototype, even in its early stages. Feedback from testing allows the team to refine elements such as video tutorials, animation guides and conversation prompts to ensure that the features are engaging and beneficial to both disabled users and non-deaf individuals.

Through these structured assessments, Handy Lingua's design process remains iterative and focused on user satisfaction. Regular evaluations during phase transitions and at the conclusion of the project establish a strong foundation for creating a solution that effectively bridges the communication gap between deaf or mute users and non-deaf individuals.

5.0 DESIGN THINKING EVIDENCE

5.1 EMPATHIZE

Observation
Based on our observations, many people do not understand sign language, yet they wish to communicate with individuals who have hearing impairments or speech disabilities. For example, when a person with a hearing impairment needs help, they may struggle to communicate because not everyone knows sign language. This issue is evident in situations where people are unable to interact effectively with individuals who rely on sign language for communication.
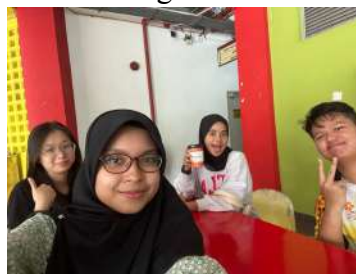
Engage (Interview)
To gain better insights into user problems and requirements, we conducted interviews both online and physically. Most interviewees admitted to not having knowledge of sign language. In fact, many preferred avoiding communication with deaf and speech-disabled individuals. They were enthusiastic about the possibility of using Handy Lingua, as it would enable them to communicate with these individuals and even learn sign language. However, some expressed concerns about the validity and accuracy of sign language in apps.

Immerse
To deepen our understanding of the challenges faced by users, we decided to learn sign language ourselves. However, we found it difficult to learn and memorize the signs quickly. While we were able to pick up a few basic signs, we quickly forgot them after a few days due to a lack of consistent practice, unlike individuals with hearing impairments, for whom sign language is a daily communication tool.

5.2 DEFINE

To develop an actionable problem statement centered on the users' needs, our team conducted a thorough analysis and discussion. We identified a significant need for an app that would not only teach and help users learn sign language but also assist in real-time communication between deaf or mute users and non-deaf users. The goal was to design an intuitive, accessible and user-friendly platform that fosters both learning and communication in an inclusive manner.

First Meeting

5.3 IDEATE

During the ideation phase, the team engaged in brainstorming sessions to conceptualize and refine the Handy Lingua app. The primary focus was on incorporating features such as tutorials, real-time translation, dictionaries and conversation guides to ensure the app effectively addresses communication challenges for deaf or mute users and non-deaf individuals. The team also collaborated on designing a logo that symbolically emphasizes the concept of the hand, highlighting its connection to sign language. Various logo ideas were proposed and the final design was selected through a voting process that prioritized criteria such as practicality and feasibility.

Additionally, the team evaluated two potential solutions for addressing communication barriers: the Sign Language App and Wearable Glasses. The Sign Language App was deemed the superior option due to its accessibility, affordability and comprehensive features, including tutorials and real-time translation which provide low barriers to adoption. In contrast, the Wearable Glasses solution was more expensive, offered only real-time subtitles and introduced additional complexity for users. Based on these considerations, the Sign Language App was selected as the more effective and inclusive solution, supporting a wider audience and fostering meaningful communication

5.4 PROTOTYPE

In the prototype phase, the team developed multiple iterations of the Handy Lingua app, beginning with low-fidelity wireframes and progressing to high-fidelity models. These prototypes were designed to showcase core features such as real-time sign-to-text conversion, gesture recognition and responsive design. Design tools like Figma were used to create the prototypes, enabling efficient feedback collection and rapid iterations based on user insights.

Key features included the ability for users to input sign language gestures, which were recognized through the app's camera or touch interface. These gestures were then converted into text and read aloud through a text-to-speech conversion system, enabling real-time communication between users. The design was also optimized for responsiveness across various devices, ensuring accessibility and ease of use for individuals with varying needs.
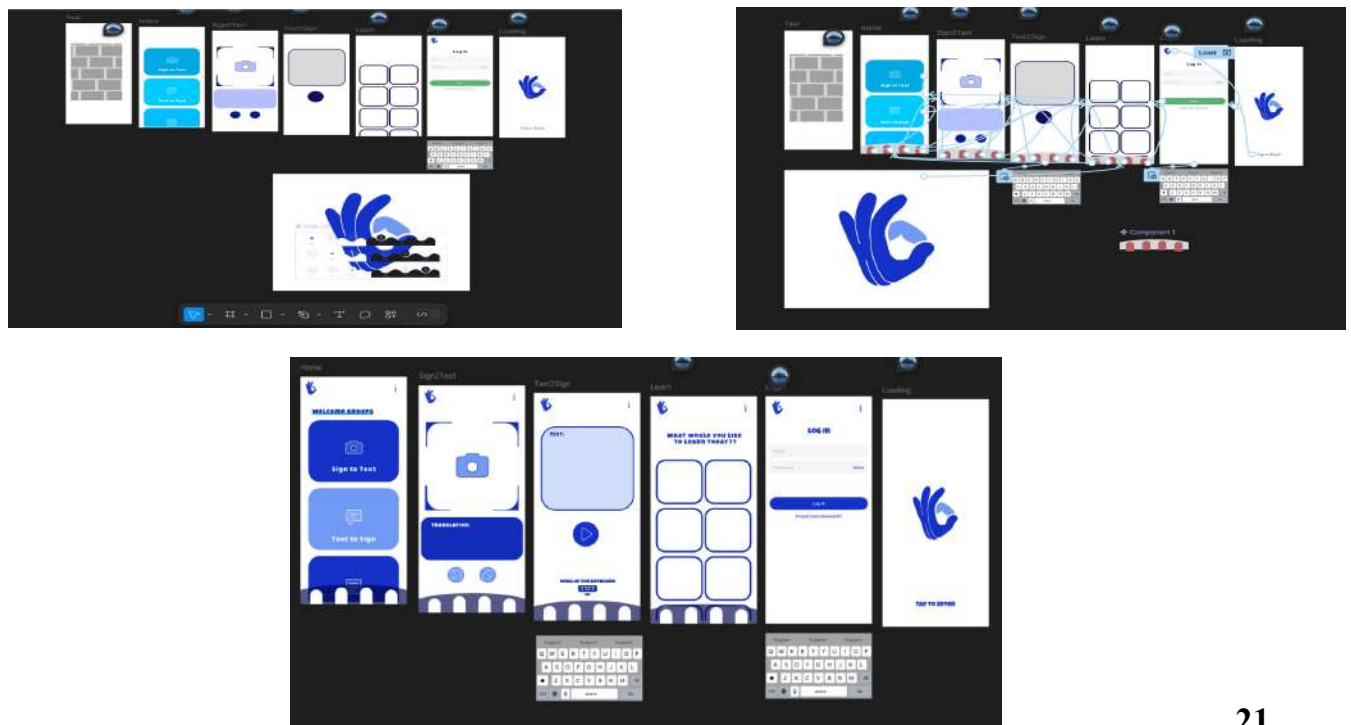
The prototypes were shared with potential users to gather feedback on usability, design and functionality. The insights gained from this process were instrumental in refining the app's features and improving its ability to meet the communication needs of its target audience.
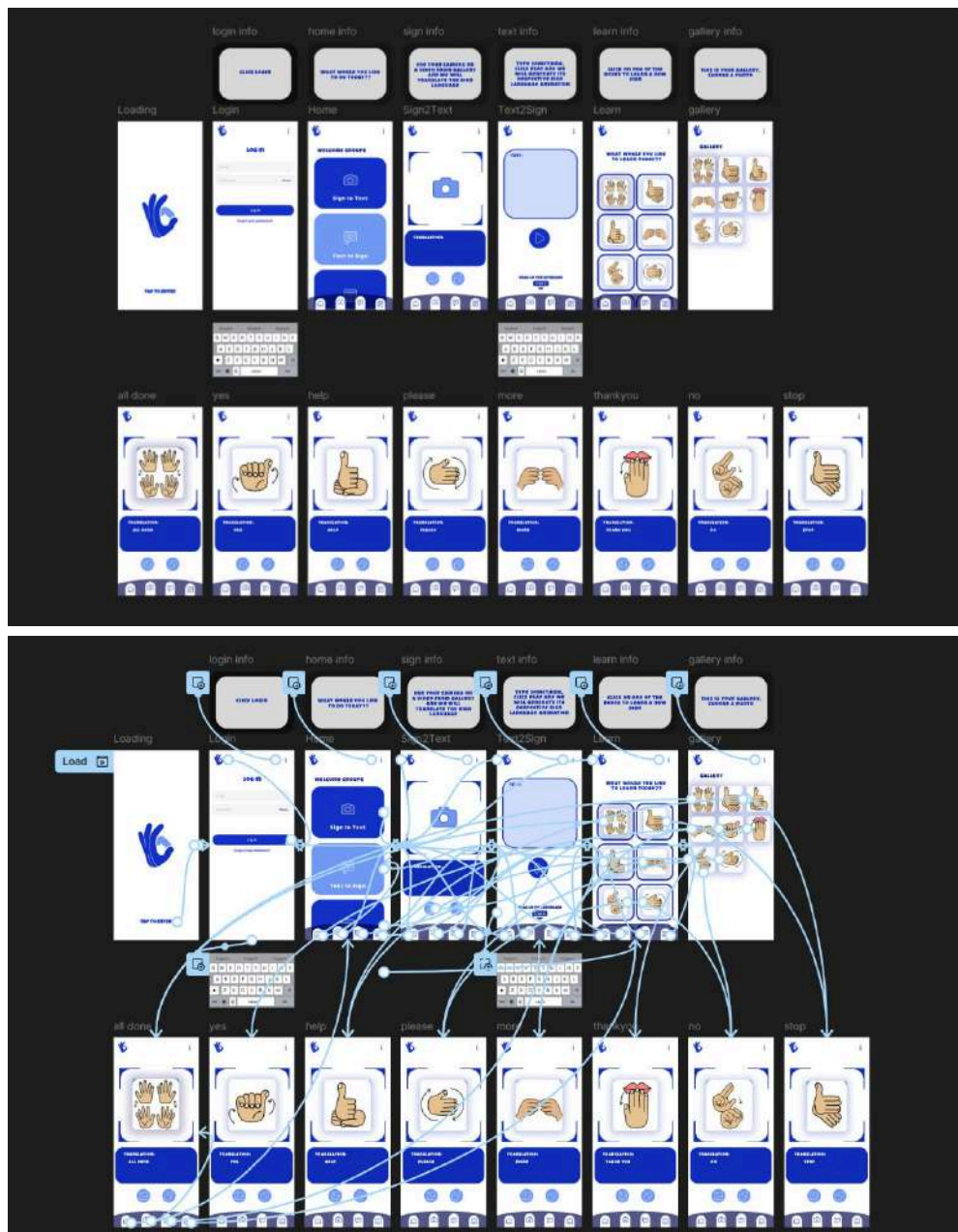
Prototypes:
The drafts of our prototypes:
Our prototype is developed using Figma, an application prototyping software. The very first iterations focused solely on developing the different features and menus of Handy Lingua, including the sign to text, text to sign and learning pages. We also highlighted and outlined how each page will interact with each other and the overall flow of the app.

In the next version of our prototype, we shifted the focus to Ui/Ux design to ensure a pleasant user experience. The design prioritizes readability and clear information display. We also improved the interactivity of the app based on feedback collected from the first prototype.

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The final version of the prototype focused on improving every aspect of the app based on the feedback collected from past versions. Added features are an information button, a back button, a simpler navigation bar, and a built-in library of basic sign language that will be available even when offline. The pictures below highlight the final look of Handy Lingua and the connections between each page of the app.
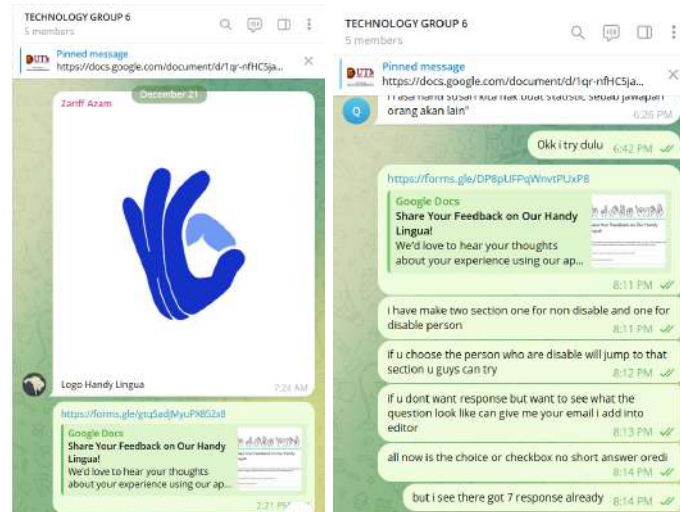
Final look of our prototypes:

Test the Prototype: https://shorturl.at/QLgOz

5.5 TEST

To refine the design and assess its effectiveness, the concept of the app was presented to users, and their feedback was gathered through a Google Form survey. This provided us with valuable insights into the user experience, which helped identify any gaps in functionality, usability issues or unmet expectations. Testing also uncovered challenges that had not been initially foreseen, such as the need for greater clarity in real-time translation, and adjustments were made based on this feedback.

5.5.1 USER FEEDBACK (INTERVIEW)

1. Muhammad Nasyat (1st year computer science student)

Feedback:
"The app was easy to use, and the tutorials for learning sign language helped me understand basic signs quickly. It's great for breaking the ice when interacting with deaf classmates."

Likes: Tutorials were engaging, and the quick-access sign dictionary was convenient for checking signs during conversations.
Suggestions: Enhance the speed and accuracy of gesture recognition for seamless communication.

2. Asyik Illahi (data engineering enthusiast)

Feedback: *"I found the conversation guides very useful—they helped me respond appropriately and made me feel more confident talking with deaf peers."*

Likes: The app's conversation prompts were clear and provided a structure for interactions. She also enjoyed the visual aids for practicing signs.

Suggestions: Add a voice command or quick-access shortcut to make the app more intuitive during live interactions.

3. Abdul Rasyid (1st year computer science student)

Feedback:
"The app is a fantastic tool for inclusivity. It helped me learn basic signs, but it also encouraged me to appreciate the effort it takes to communicate through sign language."
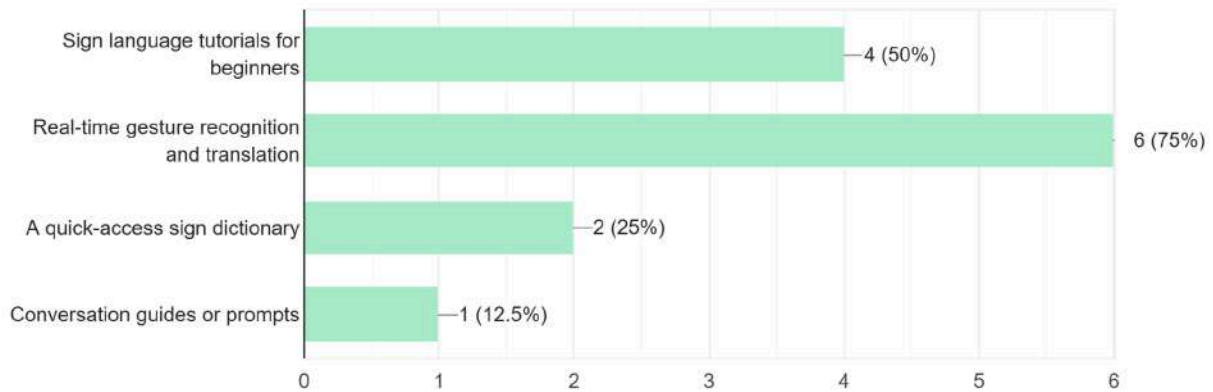
Likes: Real-time sign translation worked well for slow and clear signs. The tutorials were simple and engaging.

Suggestions: Include more intermediate and advanced sign tutorials to expand learning opportunities.

5.5.2 USER FEEDBACK (GOOGLE FORM)

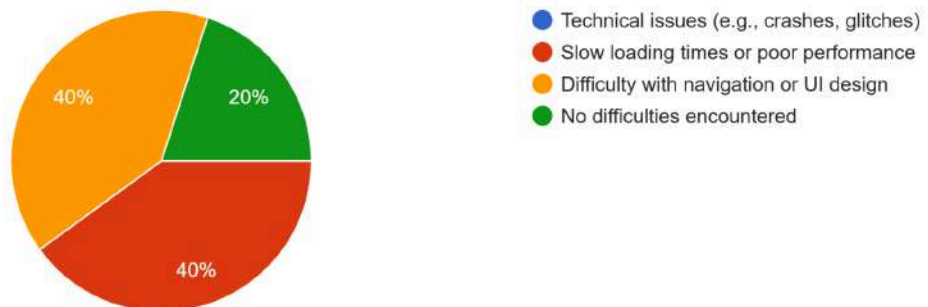What feature in the app do you find the most useful?

8 responses

Sign language tutorials for beginners	4 (50%)
Real-time gesture recognition and translation	6 (75%)
A quick-access sign dictionary	2 (25%)
Conversation guides or prompts	1 (12.5%)

What motivated you to use this app?

8 responses

- A desire to communicate better with sign language users
- General curiosity about learning sign language
- Workplace or social interaction requirements

25% 25% 50%

Is there any difficulty you encountered while using the app?

5 responses

- Technical issues (e.g., crashes, glitches)
- Slow loading times or poor performance
- Difficulty with navigation or UI design
- No difficulties encountered

40% 20% 40%

What challenges do you think you might face in using this app?

12 responses

- Difficulty learning sign language
- Understanding the app's features or navigation
- Limited knowledge of how to apply sign language in real conversations
- Access to the app on different devices or locations

50%
8.3%
8.3%
33.3%

What would encourage you to use the app more?

8 responses

- Interactive and engaging lessons
- Improved user interface for easy navigation
- More comprehensive tutorials covering different contexts
- Personal progress tracking features

33.3%
22.2%
44.4%

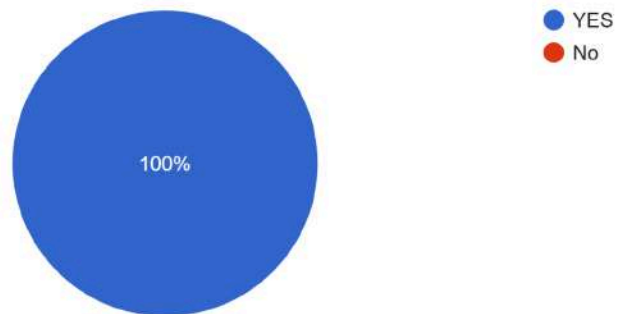## Do you think this app could help you learn or use sign language?

23 responses

- YES
- NO

100%

Would you recommend this app to others?

23 responses

YES
No

100%

Project Video Link: https://youtu.be/NM0VRr5gmQI

6.0   REFLECTION

This design thinking project has taught us many valuable lessons. As a whole, we learned the importance of teamwork and collaboration in a project, the skills needed for project management like communication, time management and task delegation, technical skills like prototyping and video editing as well as soft skills like critical thinking, report writing, progress documentation and using multiple softwares to ensure efficient workflow. Individually, this project has helped shape each of our paths and goals. Below are the individual reflections of each member regarding their dream in regard to their course, how this design thinking project impacts their goal, their plan to improve their potential in the industry.

FATIN SYAKIRAH BINTI MUHAMAD HARDON

My goal with regard to my course is to gain a deep understanding of the technology and develop practical skills that will enable me to succeed in the Computer Science industry. I want to contribute innovative solutions and solve problems. Design thinking helps me reach this goal because it teaches me how to be creative, problem solving, and focus on people's needs. To improve my potential in the industry, I plan to work on practical projects, find a mentor to guide me, and keep learning about the latest updates in my field. I also want to meet professionals, join workshops, and attend industry events to grow my skills and gain more experience.

ZARIFF BIN MOHAMMAD AZAM

I dream to develop a thorough understanding of the subjects, concepts, application and industries in regards to Computer Science. This project provided a platform for me to venture into product and application development as well as improved my skills in team management. I believe that to improve my potential in this industry, the best plan is to keep exploring, learning and adding on skills related to computer science, therefore improving my portfolio.

NUREEN FATINI BINTI ZULKEFLI

A goal of mine is to give my all to everyone in need , despite their disabilities. This little project of ours can benefit a lot of people to give hope and equality to them, and feel included in the community. Design thinking helped me reach this goal with a critical mindset to give creative ideas of app and prototype and also a logic project to be developed within the time limits with my teammate. My plan to improve my potential is to sharpen my speaking skills, so that I can build more connections for future projects and have as much help as possible to make the project come true.

WONG ZI NING

My dream is to gain the skills and knowledge needed to build a successful career and achieve my dream of contributing positively to my industry. Design thinking supports this goal by teaching me how to approach problems creatively, work on practical solutions and focus on understanding people's needs. To improve my potential in the industry, I plan to develop my skills through internships, practice teamwork on projects and stay updated with new trends and technologies. I also plan to improve my communication skills and build connections with others in the field to learn from their experiences and advice.

SARVESWARI A/P VASUTHEVAN

My goal is to leverage the holistic nature of computer science and bioinformatics to solve

real-world problems in healthcare and life sciences. I aspire to contribute to advancements in personalized medicine, drug discovery and genomic research by developing innovative computational tools and algorithms.Design thinking can have a profound impact on my goal by fostering a problem-solving mindset that is both creative and user-focused. To improve my potential in the industry, I decided to develop my skills in technical proficiency,data analysis and cloud computing. Other than that, I have planned to gain practical experience through internships, research projects and learning soft skills such as communication and teamwork.
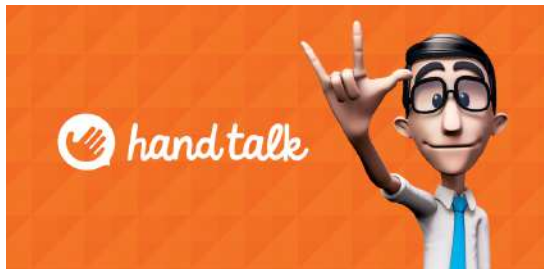
7.0 LITERATURE REVIEW

Similar Projects in Sign Language Translation
Over the years, several projects and apps have emerged with the aim of improving communication for individuals who are deaf or have speech impairments. These solutions, developed by different groups, utilize various technologies such as gesture recognition, machine learning, and avatar-based interfaces to break down communication barriers.

Hand Talk
Hand Talk is a notable project that uses a 3D avatar to translate Brazilian Sign Language (Libras) into Portuguese and vice versa. It serves as a communication tool by translating spoken or written language into sign language, bridging the gap between the deaf and hearing communities. This app highlights the use of avatars to enhance communication and inclusivity.

The ASL App
The ASL App provides educational content to help users learn American Sign Language (ASL). Through video tutorials, the app teaches users how to sign individual words and phrases, making it a helpful resource for those who want to learn sign language. Although primarily focused on teaching, it has contributed to the development of mobile resources aimed at increasing communication with deaf individuals.

SignAll
SignAll is an advanced system that uses AI and computer vision to translate American Sign Language (ASL) into text or speech in real-time. This innovative platform allows deaf individuals to communicate naturally using gestures, with the system translating their sign language into written or spoken language. It uses real-time interaction to help improve communication between deaf and hearing individuals.

SignLink
SignLink is a sign language-based communication platform, which translates sign language into text and speech. It incorporates gesture recognition and machine learning to enable communication between deaf users and hearing individuals. This project highlights the potential of real-time sign language translation.

Conclusion: These projects demonstrate the growing demand for tools that facilitate communication for individuals with hearing or speech impairments. While many of them use different technologies (from avatars to real-time gesture recognition), common themes emerge: the importance of real-time translation, user-centric design, and accessibility. Although some projects are focused on education (e.g., *The ASL App*), others, like *SignAll* and *Hand Talk*, concentrate on real-time communication, offering great potential to address unmet needs. The Handy Lingua app, designed with similar goals, builds upon these foundations by incorporating customizable features, personalized avatars, and adaptive translation mechanisms aimed at enhancing communication between deaf and hearing users.