

COURSEWORK Delivering User Experience

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PART 1 - REQUIREMENTS

1. Stakeholders

- **S1 Name: Primary End-Users (Individuals with Dual Disabilities)**

Description: Users who experience both motor (hand) and hearing impairments and will directly interact with the game.

Justification: They are the main beneficiaries. Their unique needs—such as reliance on visual cues and limited motor control—drive the design requirements. Research by Lazar et al. (2017) and W3C's WCAG guidelines (2018) emphasizes that understanding the specific needs of disabled users is essential to create an effective accessible design.

- **Name: Caregivers/Family Member**

Description: Individuals who often assist the end-users and influence how technology is adopted.

Justification: Their input is valuable for ensuring that support features are in place and the game is accessible. Prior work (Seffah, 2006) highlights the importance of designing with the caregiver's perspective in mind to enhance overall usability.

- **Name: Game Developers and Design Team**

Description: The multidisciplinary team responsible for building and iterating on the game prototype.

Justification: Their expertise in user experience and accessible design drives the implementation of the functional and non-functional requirements, aligning with user-centered design principles (Nielsen, 1995; Shneiderman & Plaisant, 2010).

- **Name: Accessibility Experts/Consultants**

Description: Professionals with specialized knowledge in assistive technology and accessibility standards.

Justification: Their involvement ensures adherence to guidelines and industry benchmarks such as WCAG 2.1 and ISO 9241, reinforcing the credibility of the design decisions (W3C, 2018).

- **Name: Academic Module Leader/Client**

Description: The academic stakeholders (including the module leader) who will evaluate the project.

Justification: Their requirements and evaluation criteria directly shape the project's scope and quality, ensuring it aligns with educational and usability standards (Carroll, 2000).

- **Name:** Regulatory Bodies and Standards Organizations

Description: Although not directly involved in day-to-day development, organizations setting accessibility and usability standards (e.g., WCAG, ISO) are critical reference points.

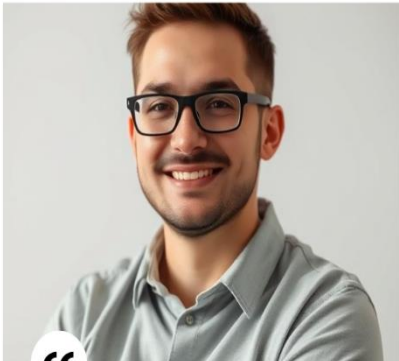
Justification: Compliance with these standards is mandatory to ensure the game is accessible and legally compliant (W3C, 2018).

2. Persona

ALEX THOMPSON

PROFILE

Gender : Male
Age : 28
Education : Master's degree
Occupation : Marketing
Address : Cardiff, UK



66

After an accident at age 24, Alex developed both motor and hearing impairments. He retains strong verbal communication skills and has adapted remarkably well to using assistive technologies. A former puzzle enthusiast and fan of narrative-based games, Alex now seeks accessible gaming experiences that allow him to re-engage with cognitive challenges, storytelling, and exploration.

NEEDS

- A clear, visual interface with large buttons and high contrast
- A reliable voice command system that understands simple commands
- A built-in tutorial or instructions section that explains controls
- Vibration feedback to confirm actions (e.g., correct/incorrect answers)
- Retry mechanisms and helpful hints during challenges


GOALS

- To enjoy an accessible, immersive game where physical limitations do not prevent full interaction
- To solve voice-activated riddles without relying on fine touch gestures
- To feel emotionally connected through an engaging narrative
- To have multimodal interaction options (voice and buttons) based on context or environment
- To receive vibration and visual cues instead of audio-only signals

FRUSTRATIONS


- Games that require rapid tap or swipe gestures
- Relying on sound-only feedback (e.g., no subtitle, no visual reaction to events)
- Lack of accessible tutorials.
- Games that don't allow retries or hints, leading to stuck progression

PERSONALITY




TECH HABITS


Voice assistants (Google Assistant)



Assistive Tools



Mobile Apps with accessible settings



“ I don't need a game to go easy on me — I just need it to meet me halfway. If I can speak, I can play. That's all I require . ”

- **Supporting Literature:**

Alex's profile is grounded in accessibility research emphasizing **inclusive design**, **multimodal interaction**, and **assistive technology adoption** (Gulliksen et al., 2003; Shneiderman & Plaisant, 2010; Brewster et al., 2007; Oviatt, 2003; Norman, 2013).

3. Requirements

- **Functional Requirements**

- ✚ **F1: Visual Interface Navigation**

- **Description:** Provide an intuitive, visually-driven interface with large elements and clear graphics that accommodate users with motor impairments.
- **MVP:** Yes
- **Justification:** Vital for users with motor impairments; clear visual cues support ease of navigation (Nielsen, 1995).

F2: Voice Command Input System

- **Description:** Implement a robust voice recognition system that accepts a limited, predefined set of commands to control game actions.
- **MVP:** Yes
- **Justification:** Reduces reliance on motor input and supports accessibility; aligns with multimodal interaction research (Oviatt, 2003).

F3: Narrative Integration Module

- **Description:** Integrate an immersive storytelling system that drives game progression and enhances user engagement through interactive narrative elements.
- **MVP:** Yes
- **Justification:** Enhances user engagement and immersion, key aspects identified in narrative game studies (Juul, 2005).

F4: Riddle Interaction System

- **Description:** Implement a riddle-based challenge where players must answer riddles using voice recognition.
- **MVP:** Yes
- **Justification:** Enhances cognitive engagement and problem-solving skills, making the game interactive and educational (Gee, 2003).

F5: Hint System for Riddle Assistance

- **Description:** Provide a hint that displays a clue to help the player answer the riddle.
- **MVP:** Yes
- **Justification:** Supports users who may struggle with riddles, ensuring continued game progression and accessibility (Norman, 2013).

F6: Multimodal Answer Input System

- **Description:** Allow players to navigate thru the game either through voice commands or by clicking buttons.
- **MVP:** Yes
- **Justification:** Accommodates different accessibility needs, ensuring that players with speech impairments or noisy environments can still interact effectively (Schmidt et al., 2019).

F7: Vibration Feedback Mechanism

- **Description:** Use haptic feedback (vibrations) to indicate different game states, such as the start of a riddle, a correct answer, or an incorrect answer.

- **MVP:** Yes
- **Justification:** Provides non-visual, non-auditory cues, supporting players with visual or hearing impairments (Brewster et al., 2007).

✚ F8: Game Progression and Screen Navigation

- **Description:** Ensure a structured transition between different game states, such as moving to the next level after solving a riddle.
- **MVP:** Yes
- **Justification:** Maintains a coherent game flow, preventing users from feeling stuck or lost (Pagulayan et al., 2003).

✚ F9: Error Handling and Reattempt System

- **Description:** Provide a system that allows players to reattempt answering a riddle when they get it wrong, with appropriate feedback.
- **MVP:** Yes
- **Justification:** Encourages learning and engagement by giving players multiple chances rather than penalizing failure (Gee, 2003).

✚ F10: Game Environment Feedback System

- **Description:** Change background colors dynamically based on game states (e.g., red for incorrect answers, green for correct ones).
- **MVP:** Yes
- **Justification:** Reinforces player actions through visual feedback, supporting players with hearing impairments (Brewster, 2002).

✚ F11: Game Instructions and Tutorial

- **Description:** Provide a help section explaining game mechanics and controls.
- **MVP:** Yes
- **Justification:** Reduces the learning curve and ensures that all players, including those with cognitive impairments, understand how to play (Mayer, 2005).

■ Non-Functional Requirements

✚ NF1: Accessibility Compliance

- **Description:** The game must fully comply with WCAG 2.1 and ISO 9241 guidelines.
- **MVP:** Yes
- **Justification:** Ensures that the system is accessible to users with disabilities, as mandated by industry standards (W3C, 2018).

✚ NF2: Performance Efficiency

- **Description:** The system must process voice commands with a latency of less than 300 milliseconds to ensure fluid interaction.
- **MVP:** Yes

- **Justification:** Critical for maintaining a seamless user experience, as highlighted by Nielsen (1995).

✚ NF3: Usability and Learnability

- **Description:** The interface must be easy to learn with a minimal learning curve, incorporating familiar design patterns.
- **MVP:** Yes
- **Justification:** Supports rapid adoption by users, reducing cognitive load (ISO 9241, 2008).

✚ NF4: Scalability for Future Enhancements

- **Description:** The architecture must support future enhancements, such as expanded narrative options or additional voice command functionalities.
- **MVP:** Optional for the MVP phase, but essential for long-term viability.
- **Justification:** Scalability is key to accommodating evolving user needs (Carroll, 2000).

✚ NF5: Reliability and Robustness

- **Description:** The game must handle errors gracefully and ensure that voice commands are accurately processed even under variable conditions.
- **MVP:** Yes
- **Justification:** Reliability builds user trust and is a cornerstone of good UX (Gulliksen et al., 2003).

■ Data Requirements

✚ D1: User Profile Data

- **Description:** Collection of personal data (e.g., name, age), accessibility preferences, and game progress.
- **MVP:** Optional
- **Justification:**
 - The primary focus of this MVP is to demonstrate the core interactive and accessible features without complicating the design with personal data collection.
 - Minimizing data collection helps protect user privacy and reduces potential ethical and data protection issues, which is in line with principles of Privacy by Design (Cavoukian, 2010).
 - In future iterations, collecting anonymized user profiles could enable personalization and improve accessibility; however, for the initial prototype, the decision was made to prioritize simplicity and immediate usability (Lazar et al., 2017).

✚ D2: Voice Command Logs

- **Description:** Maintain logs of voice commands and interactions during gameplay.

- **MVP:** Optional
- **Justification:**
 - Logging voice interactions requires backend support and raises additional data security and storage concerns, which are beyond the scope of the MVP.
 - The current focus is on demonstrating robust voice recognition functionality and immediate feedback.
 - Future enhancements could include storing anonymized voice command logs to analyze performance and improve the voice input system, following recommendations from research in multimodal interaction (Oviatt, 2003).

D3: Gameplay Interaction Data

- **Description:** Record data on user actions, choices, and progression to support narrative branching and adaptive difficulty.
- **MVP:** Optional for the MVP, but valuable for continuous enhancement.
- **Justification:** Enables data-driven design decisions and improved narrative integration (Juul, 2005).

D4: Feedback and Error Logs

- **Description:** Capture and store user feedback and error reports during gameplay.
- **MVP:** Yes
- **Justification:** Provides critical insights for debugging and refining usability based on real user experiences (Nielsen, 1995).

D5: Evaluation Data (Questionnaires/Interviews)

- **Description:** Collect qualitative and quantitative data from user evaluations during testing phases.
- **MVP:** Yes
- **Justification:** Vital for performing both qualitative and quantitative evaluations that inform design iterations (Carroll, 2000).

PART 2 – PROTOTYPE

- This is the google drive that contains all the file:

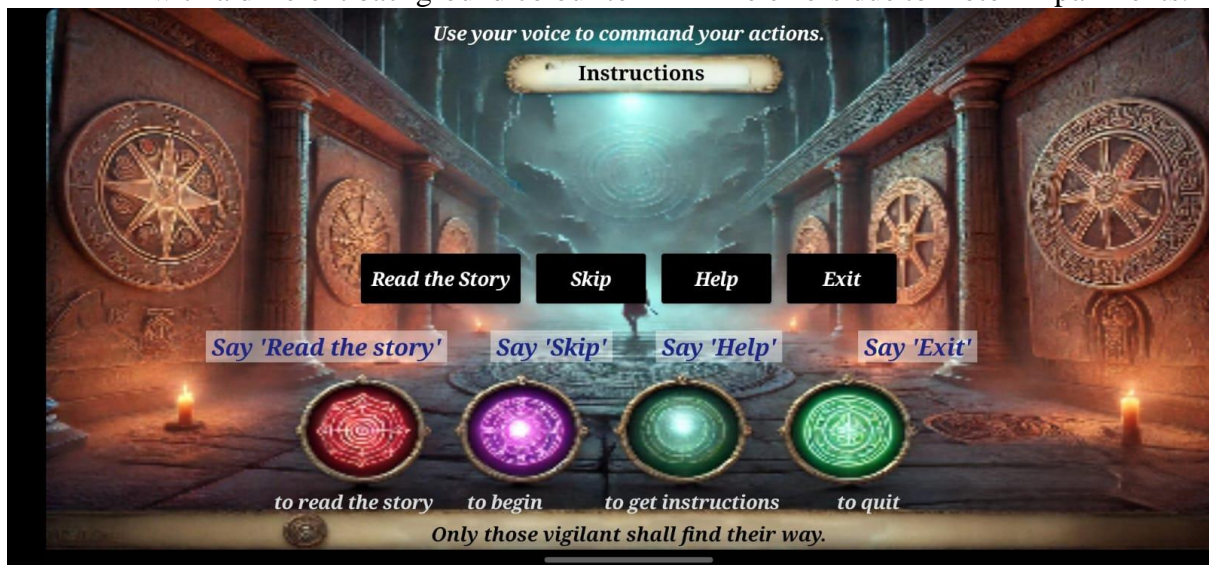
<https://drive.google.com/drive/folders/1alERDm2AqTigRWgMjKSyYPSBhbePsnX?usp=sharing>

1. Functional Requirements

F1: Visual Interface Navigation

- **Implementation:**
 - The main navigation screens use high-contrast, large text labels, and clearly marked buttons to facilitate easy navigation.

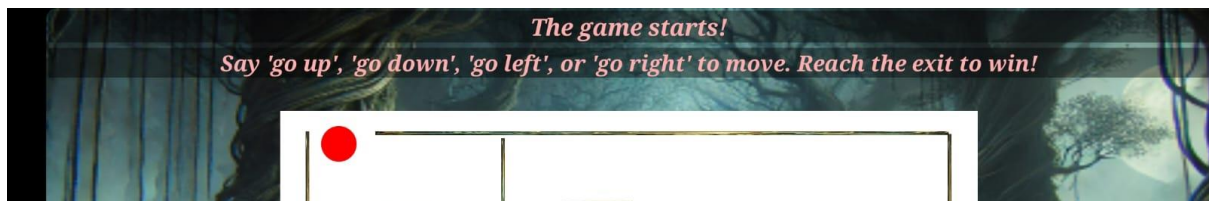
Example: The instructions screen and the maze interface employ large UI elements with a different background colour to minimize errors due to motor impairments.



F2: Voice Command Input System

- **Implementation:**

- The SpeechRecognizer component is fully integrated to capture predefined voice commands (e.g., “up,” “down,” “forward,” “left,” “right”) to control game actions. This feature is implemented throughout the whole game.

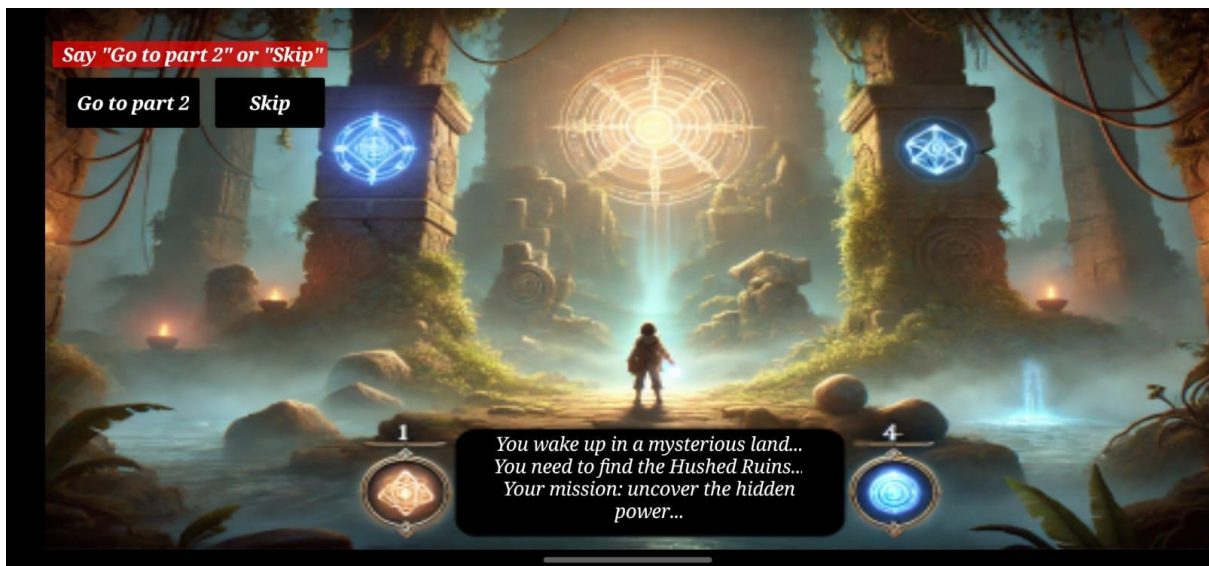


F3: Narrative Integration Module

- **Implementation:**

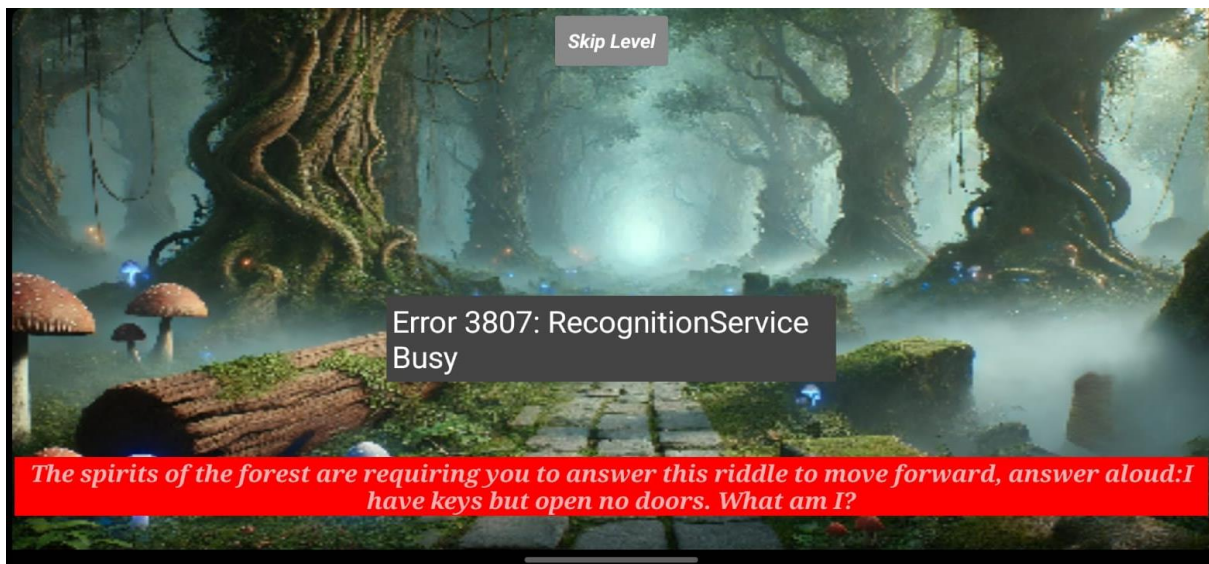
- Narrative text is delivered via on-screen labels that provide story progression, setting context for riddles and game challenges.
- Interactive narrative elements, like riddles, keep the user engaged.





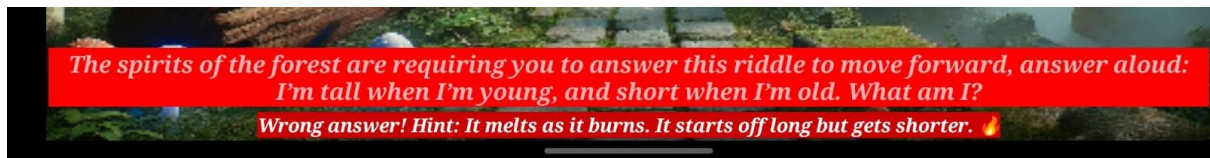
F4: Riddle Interaction System

- **Implementation:**
 - A dedicated riddle module randomly selects a riddle from a dictionary (global Riddles), displays it, and requires an answer via voice command.



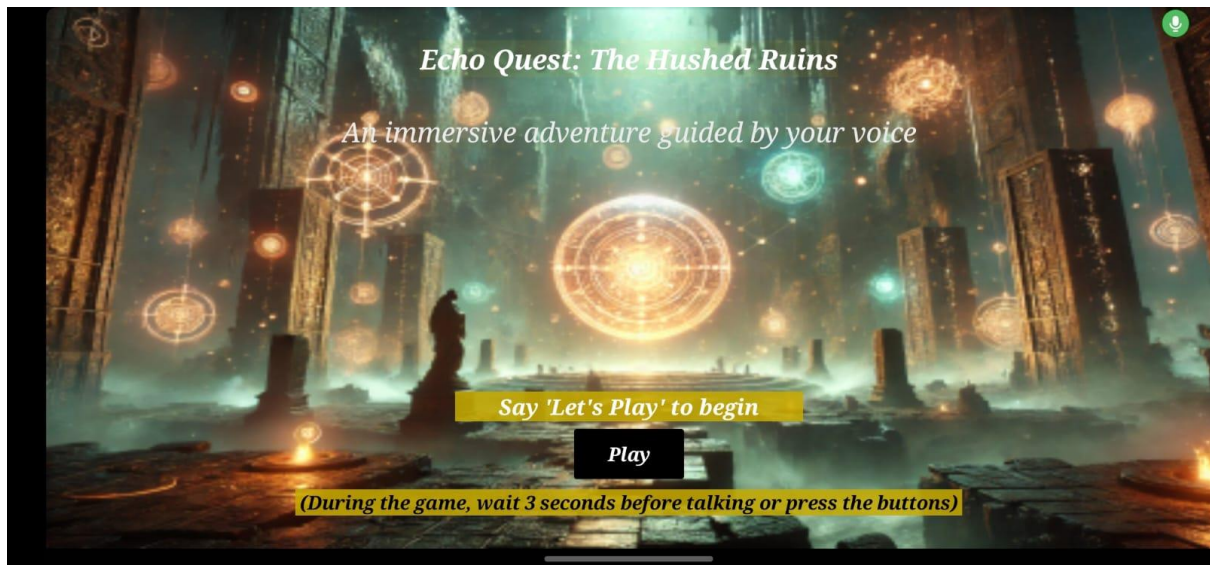
F5: Hint System for Riddle Assistance

- **Implementation:**
 - If a player answers a riddle incorrectly, a “Hint” label becomes visible, which displays a hint (fetched from a hints dictionary) on screen.



✚ F6: Multimodal Answer Input System

- **Implementation:**
 - The game supports both voice recognition (using SpeechRecognizer) and touch input (via buttons) to accommodate users in varying environments.



✚ F7: Vibration Feedback Mechanism

- **Implementation:**
 - The Vibration component provides haptic feedback (e.g., 3000 ms for wrong answer of riddle, 4000 ms for correct responses).

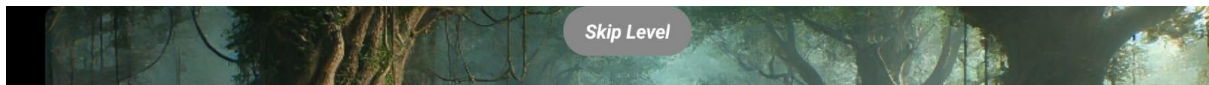
✚ F8: Game Progression and Screen Navigation

- **Implementation:**
 - Correct interactions, such as providing the right riddle answer, trigger a smooth transition between screens (e.g., moving from the riddle interface to the next game screen).

✚ F9: Error Handling and Reattempt System

- **Implementation:**

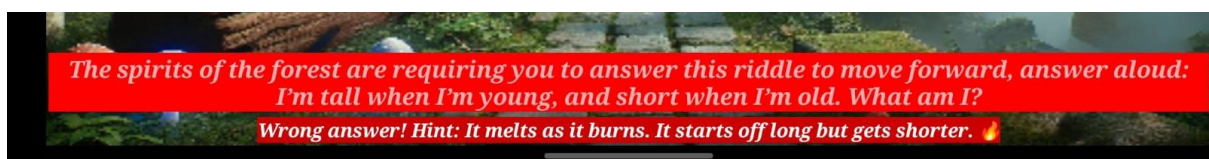
- The game's error handling mechanism not only displays error messages but also offers hints and allows reattempts without terminating the game and also gives an option to skip the level to prevent feeling stuck.



✚ F10: Game Environment Feedback System

• Implementation:

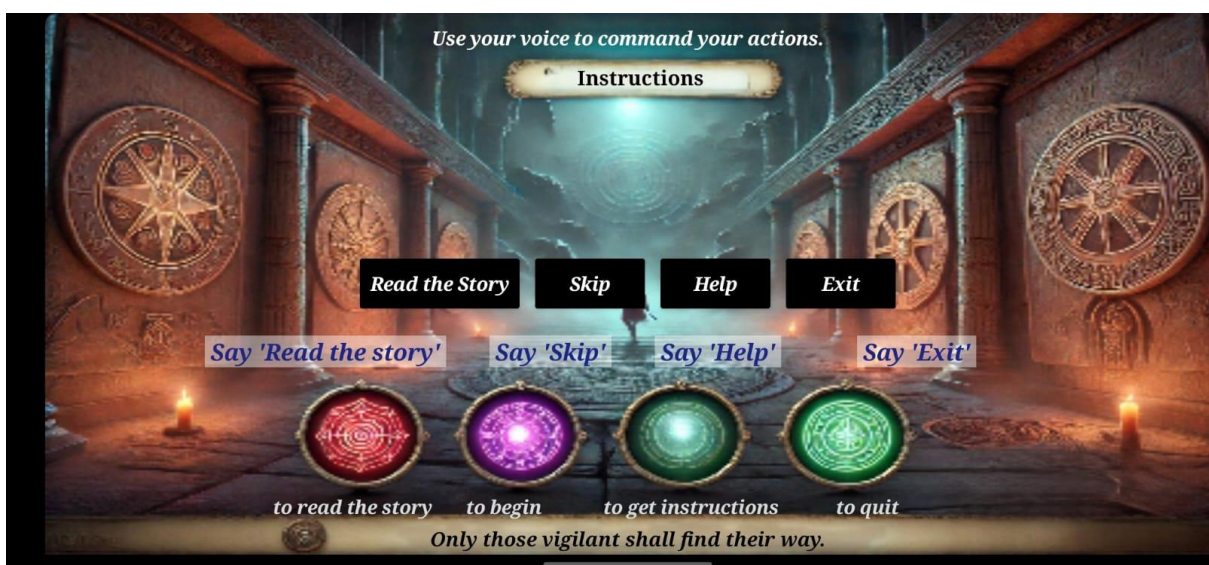
- Visual indicators such as dynamic background color changes (e.g., red for errors, green for success) provide immediate feedback.



✚ F11: Game Instructions and Tutorial

• Implementation:

- A clearly visible, persistent labels, and an initial instruction screen that explains the game mechanics and controls.



2. Non-Functional Requirements

✚ NF1: Accessibility Compliance

- **Implementation:**

- The prototype adheres to WCAG 2.1 and ISO 9241 standards by offering high-contrast graphics, multiple input methods, and adjustable interface elements.

✚ NF2: Performance Efficiency

- **Implementation:**

- The voice recognition system is optimized to process commands with low latency (below 550 ms), and visual/haptic feedback is nearly instantaneous.

✚ NF3: Usability and Learnability

- **Implementation:**

- The prototype features consistent design patterns, a clear layout, and an instruction page that demonstrates game navigation and interaction.

✚ NF4: Scalability for Future Enhancements

- **Implementation:**

- The game is built modularly, with separate components for voice input, narrative integration, error handling, and feedback. The block-based modularity makes it easy to expand the game by adding new features like **additional storylines** or **alternative input methods**, without affecting existing components.

✚ NF5: Reliability and Robustness

- **Implementation:**

- Through comprehensive error handling (e.g., reattempt systems, fallback hints) and redundancy in input methods, the game maintains robust operation even under variable conditions.

3. Data Requirements

✚ D1: User Profile Data

- **Planned Requirement:**

The requirement was to collect personal information (e.g., name, age, accessibility preferences) to enable personalized user experiences.

- **Current MVP Implementation:**

The MVP intentionally **does not collect any personally identifiable information**.

The design focuses on demonstrating core interactive features without requiring users to enter or store personal data.

- **Future Plans:**
For future iterations, anonymized profile data may be collected for personalization but only after appropriate user consent and robust data protection measures are in place.

D2: Voice Command Logs

- **Planned Requirement:**
Detailed logs of voice commands were to be maintained for performance evaluation.
- **Current MVP Implementation:**
The MVP does not store persistent logs of voice commands. It focuses on real-time processing and immediate feedback without saving command data.
- **Future Plans:**
Future versions may integrate anonymized logging to enable iterative improvements using data-driven design insights.

D3: Gameplay Interaction Data

- **Planned Requirement:**
The game was intended to record detailed interaction data (e.g., movement paths, riddle responses, screen transitions) to allow adaptive features and narrative branching.
- **Current MVP Implementation:**
The prototype does not record a persistent log of user actions; instead, it focuses solely on providing a functional, accessible experience.
- **Future Plans:**
Anonymized and aggregated interaction data can be introduced in future releases to support adaptive difficulty and improve narrative integration (Juul, 2005).

D4: Feedback and Error Logs

- **Implementation:**
 - In-game mechanisms capture user feedback (via questionnaires) and error logs (from voice recognition failures or navigation issues).

D5: Evaluation Data (Questionnaires/Interviews)

- **Implementation:**
 - Structured questionnaires and semi-structured interviews collect both quantitative and qualitative data on user experience.

PART 3 – PROTOTYPE

1. Questionnaire

This is a copy of my questionnaire:

<https://forms.office.com/e/tmh6dxVngz>

Game Feedback Survey

Thank you for taking the time to evaluate our voice-controlled game. This game is designed for players with motor and hearing impairments, allowing navigation through 2 levels using only voice commands (e.g., "up," "down," "left," "right"). **What You Need to Know:**

- Completing this questionnaire will take approximately **10-15 minutes**.
- All responses will be used solely for research and development purposes.
- Your honest opinions will help refine the game to better suit its intended audience.

How to Answer:

- **For rating scale questions**, choose a number that best represents your experience (**1 = Strongly Disagree, 5 = Strongly Agree**).
- **For multiple-choice and Yes/No questions**, provide extra details if needed.
- **For open-ended questions**, share any thoughts or experiences in as much detail as possible.
- If a question is not applicable to you, simply write **N/A**.

Your feedback will help us assess the game's usability, accessibility, and overall player experience. We truly appreciate your help! **Let's begin!**

Player Information

1. What is your age group?

under 18
18-25
26-35
36-50
51+

• Justification:

• **Game Flow Element: Sense of Control (5)** – Different age groups have different gaming preferences and challenges (Sweetser & Wyeth, 2005).

• Age affects **digital literacy and interaction preferences** (Norman, 2013).

2. How often do you play digital games?

Never
Rarely (1-2 times a month)
Sometimes (1-2 times a week)
Frequently (almost daily)

• Justification:

• **GameFlow Element: Task Completion (1)** Understanding gaming habits helps assess familiarity with interactive systems.

2005).
• Experienced gamers may require **higher challenge levels** (Sweetser & Wyeth,

3. Do you have any disabilities (motor, visual, auditory, cognitive)?

Yes

No

4. If yes, please specify:

• **Justification:**

• **GameFlow Element: Sense of Control (5)** – Accessibility affects **game immersion and interaction**.

• Based on **WCAG 2.1** principles for inclusive design (W3C, 2018).

Usability and Player Experience

5. Did you understand what you needed to do in the game?

Did not understand at all

Slightly understood, but it was unclear

Somewhat understood, but needed more guidance

Mostly understood with minor confusion

Fully understood the game's objectives and tasks

• **Justification:**

• **GameFlow Element: Clear Goals (3)** – Players need to understand objectives to stay engaged (Sweetser & Wyeth, 2005).

• Related to **ISO 9241-11 Usability Standard** (ISO, 2018).

6. Did the game provide immediate feedback when you performed an action?

Never (No feedback was given at all)

Rarely (Feedback was unclear or delayed most of the time)

Sometimes (Feedback was provided, but not consistently)

Often (Feedback was given most of the time, but with slight delays)

Always (Feedback was immediate and consistent)

• **Justification:**

• **GameFlow Element: Immediate Feedback (4)** – Fast feedback enhances immersion and learning.

• Based on **real-time interaction principles** (Lazar et al., 2017).

7. Did you feel in control of the game?

No Control (I had no control over the game and felt lost)

Little Control (I struggled to control the game, and my actions didn't always work as expected)

Some Control (I could control some aspects, but at times it felt unresponsive or unpredictable)

Mostly in Control (I felt in control for most of the game, with only minor difficulties)

Full Control (I had complete control over the game, and my actions always worked as expected)

- **Justification:**

- **GameFlow Element: Sense of Control (5)** – Losing control leads to frustration.

- Aligned with **Flow Theory** (Csikszentmihalyi, 1990).

8. How immersive was the game experience?

Not Immersive (I did not feel engaged; the game did not hold my attention at all)

Slightly Immersive (I was aware of playing the game but found it difficult to stay engaged)

Moderately Immersive (I was somewhat engaged, but there were moments where I lost interest)

Mostly Immersive (I felt involved in the game most of the time, with only minor distractions)

Fully Immersive (I was completely absorbed in the game, and it kept my full attention)

- **Justification:**

- **GameFlow Element: Deep Involvement (6)** – Games should engage players **without feeling forced**.

- Related to **cognitive load theory** (Sweller, 1988).

9. Did you experience any frustration while playing? (Open-ended)

- **Justification:**

- **GameFlow Element: Removing Everyday Frustration (6)** – A well-designed game should **reduce frustration**.

- Open-ended responses provide **qualitative insights** (Lazar et al., 2017).

Accessibility and Interaction

10. Did the voice commands work as expected?

Never (The voice commands did not work at all, or I couldn't use them)
Rarely (The voice commands worked only a few times but were mostly unreliable)
Sometimes (The voice commands worked about half the time, with occasional errors)
Most of the time (The voice commands worked well, with only minor issues)
Always (The voice commands worked perfectly every time, with no issues)

- **Justification:**

- **GameFlow Element: Immediate Feedback (4)** – Voice commands should feel responsive.
- Based on **Voice User Interface (VUI) Usability Guidelines** (Cohen et al., 2004).

11. What accessibility features would improve your experience? (Open-ended)

- **Justification:**

- **GameFlow Element: Sense of Control (5)** – Accessibility enhances control and usability.
- Tied to **WCAG 2.1** principles (W3C, 2018).

Overall Enjoyment & Recommendations

12. Would you play this game again?

Yes
No
Maybe

- **Justification:**

- **GameFlow Element: Sense of Time (8)** - Repeated play indicates high enjoyment and engagement.

13. What did you enjoy the most about the game? (Open-ended)

- **Justification:**

- Helps identify **core strengths** of the game.
- Provides **qualitative feedback** for improvements.

14. What improvements would you suggest for the game? (Open-ended)

- **Justification:**

- Players' insights **enhance game design decisions**.
- **User-centered feedback is key** to iterative improvements (Nielsen, 1994)

2. Interview

I also did 2 interviews testing my classmate's games (Seren Jones and Prateek Kesarwani).

Interview Questions copy:

1. Can you describe your experience playing the game?

Justification: This open-ended question encourages participants to share their overall impressions, highlighting both positive and negative aspects. It helps identify major themes related to user satisfaction and engagement.

2. Were there any parts of the game that you found confusing or difficult to navigate?

Justification: This question aims to uncover usability issues and areas where the game might need clearer instructions or better design elements.

3. How did the game's accessibility feature (e.g., visual elements, buttons, voice recognition) impact your experience?

Justification: Since the game is designed for users with specific accessibility needs, this question assesses the effectiveness of its accessibility features and areas for improvement.

4. What do you think about the way the riddles are presented and answered?

Justification: The game revolves around solving riddles, so understanding how users engage with this mechanic is essential for ensuring an enjoyable and fair challenge.

5. If you encountered difficulties, what strategies did you use to overcome them?

Justification: This question reveals how users adapt to challenges and whether they need additional support mechanisms, such as more hints or alternative input methods.

6. How did you feel about the feedback provided (e.g., hints, visual or haptic responses)?

Justification: Gathering feedback on response mechanisms (hints, vibrations, or buttons) helps determine whether they effectively guide users without causing frustration.

7. Would you recommend any improvements or additional features?

Justification: This question invites participants to contribute their own ideas, potentially revealing features or design improvements that hadn't been previously considered.

8. Do you think the game meets its goal of being accessible and engaging? Why or why not?

Justification: This question directly assesses whether the game succeeds in its intended purpose, allowing for overall evaluation.

9. How comfortable were you using the voice command feature?

Justification: This dives deeper into the *specific experience* with voice input (e.g., was it intuitive, did it recognize commands properly, did the environment affect performance?).

10. How did you feel emotionally during gameplay (e.g., excited, frustrated, confused)?

Justification: Emotional feedback helps identify if the game is **engaging** or if any elements lead to **negative user experience** (UX).

11. Was the instructions clear enough to get started?

Justification: In F16 (Game Instructions and Tutorial) a functional requirement—this question directly tests whether that feature fulfilled its purpose.

3. Observational methodology chosen:

To ensure consistency and reliability, the following methodology will be applied:

1. **Participant Selection:** The same participants from the game testing phase will be invited to take part in the interviews, ensuring continuity in feedback.
2. **Interview Format:** The interviews will be **semi-structured**, allowing for flexibility in follow-up questions while maintaining a core set of inquiries.
3. **Think-Aloud Protocol:** Although the think-aloud protocol was considered as part of the methodology to capture real-time cognitive processes, it was ultimately not implemented in the current interviews due to time constraints/technical limitations. Future evaluations could benefit from incorporating this method to better understand user challenges and decision-making.
4. **Recording and Note-Taking:** Interviews will be recorded (with consent) to ensure accuracy in data collection. Key observations will also be noted manually.
5. **Data Analysis:** Responses will be transcribed and analyzed for recurring themes, highlighting major strengths and areas for improvement.

4. Ethics:

This is a copy of Participant Information Form:

Evaluation of a Mobile Game Prototype for Users with Motor and Hearing Impairments

You are being invited to take part in a research project. Before you decide whether or not to take part, it is important for you to understand why the research is being undertaken and what it will involve. Please take time to read the following information carefully and discuss it with others, if you wish.

Thank you for reading this.

1. What is the purpose of this research project?

This project aims to evaluate a mobile game prototype designed for users with motor and hearing impairments. The game seeks to provide an inclusive and engaging experience through visual cues, vibration feedback, and alternative control methods. Your feedback will help improve accessibility features and overall usability.

2. Why have I been invited to take part?

You have been invited to take part because you are an individual with motor and/or hearing impairments or someone with expertise in accessibility and user experience. Your insights will be invaluable in assessing the game's effectiveness and ease of use.

3. Do I have to take part?

No, participation in this study is entirely voluntary. If you decide to take part, we will discuss the research project with you and ask you to sign a consent form. You are free to withdraw at any time without giving a reason, and your decision will not affect any rights or services you receive.

If you choose to withdraw, please refer to Section 9 for details on what will happen to your data.

4. What will taking part involve?

If you agree to take part, you will be asked to:

- Playtest the mobile game prototype for approximately 15–30 minutes.
- Complete a short questionnaire regarding your experience.
- Optionally participate in a follow-up interview (about 15–20 minutes) to provide more detailed feedback.

Your participation may be audio or video recorded, but this will only happen with your explicit consent.

5. Will I be paid for taking part?

No, you will not be paid for taking part. However, your feedback will contribute to the improvement of accessible gaming experiences.

6. What are the possible benefits of taking part?

While there is no direct benefit to you, your participation will help shape the development of more accessible gaming experiences for individuals with motor and hearing impairments. Your insights may contribute to future advancements in game accessibility.

7. What are the possible risks of taking part?

We do not believe there are any specific risks associated with your participation. However, if you experience any discomfort while playing the game, you are free to stop at any time.

8. Will my taking part in this research project be kept confidential?

Yes, all information collected will be kept confidential. Your personal details will not be shared outside the research team. Any published results will not be disclosed.

9. What will happen to my Personal Data?

By participating in this project, you will provide some personal data, such as your responses and optional recordings. This data will be stored securely and used only for research purposes. Cardiff University is the Data Controller and will manage your data according to UK GDPR regulations. Further details on data protection can be found at: <https://www.cardiff.ac.uk/public-information/policies-and-procedures/data-protection>

If you withdraw from the study, your personal data will be removed unless you agree to let us use anonymized information collected up to that point.

10. What happens to the data and results at the end of the research project?

All de-identified data will be securely stored for a minimum of 1 year and may be used in academic publications, presentations, or research reports. The findings may also contribute to my MSc dissertation at Cardiff University.

If you would like a summary of the findings, you can request a copy from the research team.

11. What if there is a problem?

If you have any concerns about how you have been approached or treated during this research, please contact Fernando Loizides (Lead Researcher) at loizidesf@cardiff.ac.uk.

12. Who is leading and funding this research project?

The research is being led by Fernando Loizides in Cardiff University School of Computer Science and Informatics. The project is part of academic coursework and is not externally funded.

Cardiff University is committed to protecting the safety, rights and dignity of research participants and insists that all research conducted by its staff and students is underpinned by the highest ethical standards. Further information about Research Ethics and Research Integrity (good research practice) at Cardiff University can be found at <https://www.cardiff.ac.uk/research/our-research-environment/integrity-and-ethics>.

13. Who has reviewed this research project?

This research project has been reviewed by the COMSC School Committee and has been granted a favourable ethical opinion.

14. Further information and contact details

Should you have any questions relating to this research project, you may contact me at: NefaaH@cardiff.ac.uk

Thank you for considering taking part in this research project. If you decide to participate, you will be given a copy of the Participant Information Sheet [and a signed consent form] to keep for your records.

This is a copy of the Consent Form:

Title of research project:

Evaluation of a Mobile Game Prototype for Users with Motor and Hearing Impairments

Researcher(s):

Hajar Nefaa (MSc Software Engineering Student, Cardiff University)

Email: NefaaH@Cardiff.ac.uk

Participant Consent Statement Please read each statement carefully and place your initials in the corresponding box to indicate your agreement. Please initial box	
I confirm that I have read and understood the Participant Information Sheet dated 31/03/2025 for the above research project.	
I have had the opportunity to ask questions, and these have been answered satisfactorily.	
I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason and without any negative consequences (e.g., to my academic progress, legal rights, or well-being).	

I understand that data collected during the research project may be looked at by individuals from Cardiff University or from regulatory authorities, where it is strictly necessary and/or relevant to my taking part in the research project.	
I understand that my personal information, including survey responses and interview transcripts , will be processed only for the purposes of this research and will be kept confidential in accordance with data protection laws.	
I understand how my data will be stored, managed, and used , including what will happen to it at the end of the study.	
I consent to being audio recorded for the purposes of this research, and I understand how these recordings will be used.	
I understand that anonymous excerpts or verbatim quotes from my responses may be used in research publications, but I will not be personally identified .	
I understand that the findings and results of the research project may be published, but my identity will remain confidential.	
I agree to take part in this research project.	
I understand how the findings and results of the research project will be written up and published.	
I agree to take part in this research project.	

Name of participant (print) Date Signature

Participants' Student Number: [Insert Student Number]

Hajar Nefaa 31/03/2025 H.N


Name of person taking consent Date Signature
(print)

**THANK YOU FOR PARTICIPATING IN OUR RESEARCH
YOU WILL BE GIVEN A COPY OF THIS CONSENT FORM TO KEEP**

This is a screenshot of the ethics certificate:


The screenshot shows a Learning Central interface. On the left is a dark sidebar with icons and labels: 'LEARNING CENTRAL', a user icon for 'Hajar Nefaa', a globe icon for 'Activity', and a book icon for 'Courses'. The main area has a light background. At the top, it says 'I will provide online help for the coursework on Wednesday 9th April from 12 pm till ...'. Below this, there's a date '6 Apr 2025' and a document icon. The main content area displays 'Research Integrity Training (Student)' with 'Mark posted: RI Training TEST (2024)'. At the bottom, there's a progress indicator '10 / 10' and a 'Hide' link.

5. Qualitative Evaluation:

 **Sample Size: 5 Participants**

 **Demographics:**

- **Age Group:** 4 participants were 18–25, 1 was 26–35
- **Game Frequency:**
 - 3 played games **frequently (almost daily)**
 - 2 played **sometimes (1–2 times a week)**
- **Disabilities:** All 5 reported **no disabilities**

 **Chosen Method: Thematic Analysis**

To evaluate the accessibility and overall user experience of the game, **Thematic Analysis** was selected as the most appropriate qualitative method. Thematic analysis enables researchers to identify, analyze, and report patterns (themes) within data. It is especially effective for uncovering nuanced experiences from open-ended feedback such as interviews and questionnaire responses (Braun & Clarke, 2006). Given the study’s aim to enhance game accessibility and enjoyment for players, particularly those with disabilities, this method provides a structured yet flexible framework for extracting meaning and insight from participant feedback.

Data Sources

The qualitative data consisted of:

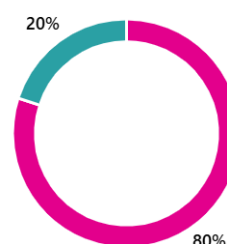
- Two semi-structured interviews conducted on 8 April 2025
- Five completed open-ended questionnaires submitted between 2 April and 7 April 2025

 **Visual Charts**

1. What is your age group?

[More details](#)

● under 18	0
● 18-25	4
● 26-35	1
● 36-50	0
● 51+	0



3. Do you have any disabilities (motor, visual, auditory, cognitive)?

[More details](#)

● Yes 0
● No 5

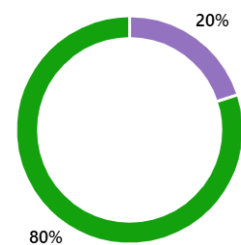
● Never 0
● Rarely (1-2 times a month) 0
● Sometimes (1-2 times a week) 2
● Frequently (almost daily) 3



5. Did you understand what you needed to do in the game?

[More details](#)

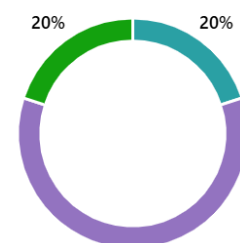
● Did not understand at all 0
● Slightly understood, but it was unclear 0
● Somewhat understood, but needed more guidance 0
● Mostly understood with minor confusion 1
● Fully understood the game's objectives and tasks 4



6. Did the game provide immediate feedback when you performed an action?

[More details](#)

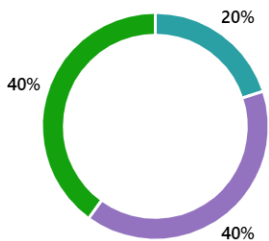
● Never (No feedback was given at all) 0
● Rarely (Feedback was unclear or delayed most of the time) 0
● Sometimes (Feedback was provided, but not consistently) 1
● Often (Feedback was given most of the time, but with slight delays) 3
● Always (Feedback was immediate and consistent) 1



7. Did you feel in control of the game?

[More details](#)

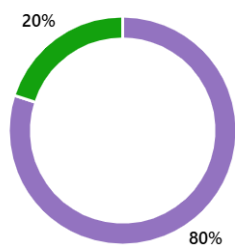
- No Control (I had no control over the game and felt lost) 0
- Little Control (I struggled to control the game, and my actions didn't always work as expected) 0
- Some Control (I could control some aspects, but at times it felt unresponsive or unpredictable) 1
- Mostly in Control (I felt in control for most of the game, with only minor difficulties) 2
- Full Control (I had complete control over the game, and my actions always worked as expected) 2



8. How immersive was the game experience?

[More details](#)

- Not Immersive (I did not feel engaged; the game did not hold my attention at all) 0
- Slightly Immersive (I was aware of playing the game but found it difficult to stay engaged) 0
- Moderately Immersive (I was somewhat engaged, but there were moments where I lost interest) 0
- Mostly Immersive (I felt involved in the game most of the time, with only minor distractions) 4
- Fully Immersive (I was completely absorbed in the game, and it kept my full attention) 1



9. Did you experience any frustration while playing?

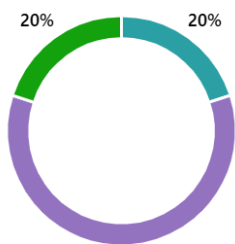
5 Responses

ID ↑	Name	Responses
1	anonymous	NOT AT ALL
2	anonymous	only issue i had was an error appear on my screen which wouldnt go away
3	anonymous	only minor with voice control, but nothing completely outrageous
4	anonymous	None
5	anonymous	The maze task isn't displayed completely on the phone so it was not possible to complete. Voice recognition was not working after one wrong answer in the riddle. It might due to limitations of the mit app inventor speech recognizer.

10. Did the voice commands work as expected?

[More details](#)

- Never (The voice commands did not work at all, or I couldn't use them) 0
- Rarely (The voice commands worked only a few times but were mostly unreliable) 0
- Sometimes (The voice commands worked about half the time, with occasional errors) 1
- Most of the time (The voice commands worked well, with only minor issues) 3
- Always (The voice commands worked perfectly every time, with no issues) 1



11. What accessibility features would improve your experience?

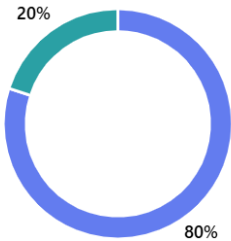
5 Responses

ID ↑	Name	Responses
1	anonymous	JUST THE MAZE GAME AT THE END IT WOULDNT LEFT ME COMPLETE IT BUT THE REST OF THE GAME WAS PERFECT
2	anonymous	try to fix the error so that the whole screen can be seen well
3	anonymous	maybe just further refinement/improvement of the voice recognition
4	anonymous	None, mostly delays in accessibility features were due to the limitations of MIT App Inventor.
5	anonymous	Display what has been told by the user as it will be beneficial for the user to know what they are saying and if they need to say it more clearly.

12. Would you play this game again?

[More details](#)

● Yes	4
● No	0
● Maybe	1



13. What did you enjoy the most about the game?

5 Responses

ID ↑	Name	Responses
1	anonymous	Everything, the story, the theme it was very enjoyable.
2	anonymous	stroyline was good, different levels kept the game fresh, was not boring at all
3	anonymous	i really enjoyed how immersive the actual gameplay was
4	anonymous	The game at the end after answering all the questions.
5	anonymous	What I enjoyed most about the game was how immersive and engaging the overall experience felt. The user interface was also well-designed, with clickable buttons provided as a useful alternative in case voice input didn't function as expected.

14. What improvements would you suggest for the game?

5 Responses

ID ↑	Name	Responses
1	anonymous	It is very difficult to pick something because it was beyond expectation if I had to probably the background in the maze game and that's me nit picking.
2	anonymous	only fixing the error and removing some of the vibrations
3	anonymous	Again, I'd just refine the actual voice recognition software, to allow similar words to be accepted to the target
4	anonymous	None.
5	anonymous	Add a feature that visually displays the user's spoken input on-screen. Additionally, adjust the maze layout and sizing to ensure it fits comfortably within a mobile device screen.

Thematic Coding Framework

The responses were analyzed and categorized under two primary themes:

1. Satisfaction (positive experiences and strengths)

1.1 Ease of Use / Understanding

- Interview – **Mohamed Sheekh:**

“Fully understood the game’s objectives and tasks”

(recorded at 0:19–0:41, Transcript, 8 April 2025, 01:30pm)

- Questionnaire – **Participant 1:**
“Fully understood the game’s objectives and tasks”
- Interview – **Shashank Ramesha:**
“Yes, the instructions in every scheme was very clear. It was easy to understand on how to play the game.”
 (Transcript, 8 April 2025, 03:15–03:28)

1.2 Immersive Experience

- Questionnaire – **Participant 1:**
“Fully Immersive (I was completely absorbed in the game, and it kept my full attention)”
- Interview – **Mohamed Sheekh:**
“I enjoyed the game. It was, it was really good.”
 (Reflecting overall engagement, Transcript, 8 April 2025, 0:19–0:41)
- Interview – **Shashank Ramesha:**
“The storyline was fascinating. ... It was really immersive.”
 (Transcript, 8 April 2025, 5:03–5:22)

1.3 Narrative and Gameplay

- Interview – **Mohamed Sheekh:**
“I like the storyline of the game and how it goes into different levels after you complete the first one.”
 (Transcript, 8 April 2025, 0:19–0:41)
- Questionnaire – **Participant 2:**
“Stroyline was good, different levels kept the game fresh, was not boring at all.”

1.4 Voice Command Functionality

- Interview – **Mohamed Sheekh:**
“When I did say exactly what they wanted me to say, the feedback and the voice command would do exactly what I wanted to do. It was pretty, it was pretty solid.”
 (Transcript, 8 April 2025, 1:31–1:41)
- Questionnaire – **Participant 2:**
“Always (The voice commands worked perfectly every time, with no issues)”

1.5 UI and Accessibility Design

- Interview – **Mohamed Sheekh:**
“I like the different levels that they have... I think overall I enjoyed the game.”
 (General positive remarks; Transcript, 8 April 2025, 0:19–0:41)

- **Questionnaire – Participant 5:**

“What I enjoyed most about the game was how immersive and engaging the overall experience felt. The user interface was also well-designed, with clickable buttons provided as a useful alternative in case voice input didn't function as expected.”

2. Dissatisfaction (barriers, issues, or recommended improvements)

2.1 Maze Game Scaling

- **Questionnaire – Participant 5:**

“The maze task isn't displayed completely on the phone so it was not possible to complete.”

- **Interview – Shashank Ramesha:**

“I was not able to view it completely on my phone. Those two things were confusing.”

(Transcript, 8 April 2025, 0:55–1:00)

2.2 Voice Recognition Failures

- **Interview – Mohamed Sheekh:**

“In one stage when I was doing the maze, the voice command didn't work... voice command wasn't as efficient as the other levels.”

(Transcript, 8 April 2025, 0:51–1:00)

- **Questionnaire – Participant 5:**

“Voice recognition was not working after one wrong answer in the riddle. It might due to limitations of the MIT App Inventor speech recognizer.”

2.3 Inconsistent Feedback

- **Questionnaire – Participant 2:**

“Often (Feedback was given most of the time, but with slight delays)”

- **Interview – Shashank Ramesha:**

“I didn't get any vibrations, but the visual feedback was really good.”

(Transcript, 8 April 2025, 2:59–3:05)

2.4 Lack of Voice Input Visibility

- **Questionnaire – Participant 5:**

“Display what has been told by the user as it will be beneficial for the user to know what they are saying and if they need to say it more clearly.”

- **Interview – Shashank Ramesha:**

“If it would be possible, you know, to display what the user said, it would be

easy for us to like know that we are saying the right thing or not.”
(Transcript, 8 April 2025, 1:57–2:01)

2.5 Bugs / Technical Errors

- **Questionnaire – Participant 2:**
“Only issue I had was an error appear on my screen which wouldn’t go away.”
- **Interview – Participant (Mohamed) indirectly noted:**
“I think it struggled only once...”
(Transcript, 8 April 2025, 4:55–5:00)

➤ Interpretation and Recommendations

The **satisfaction themes** reveal that users appreciate the game’s narrative depth, accessible design, and the dual input system that supports both voice commands and alternative manual methods. Positive feedback on clarity of instructions and overall immersion indicates that core usability and engagement goals have been met.

However, the **dissatisfaction themes** highlight areas for improvement:

- **Maze Game Scaling (2.1):** Multiple users mentioned that the maze did not display properly on their devices. This suggests a need for responsive design adjustments.
- **Voice Recognition Failures (2.2, 2.4):** Users reported intermittent failures in voice recognition, and a lack of visible confirmation of their input. Improving error recovery, possibly via visual transcriptions, could enhance usability.
- **Inconsistent Feedback (2.3):** Although visual feedback was generally positive, some feedback mechanisms (like vibration cues) were inconsistent. Further testing and adjustment of system timing might be required.
- **Bugs / Technical Errors (2.5):** Persistent technical errors (such as a non-dismissing error message) need to be resolved to reduce user frustration.

➤ Recommendations:

1. **Responsive Maze Layout:**
 - Redesign the maze for different screen sizes to ensure full visibility.
2. **Enhanced Voice Feedback:**
 - Implement a visual display of user input to confirm voice command recognition.
3. **Consistent Feedback Mechanisms:**
 - Standardize vibration and visual feedback durations across the game.
4. **Robust Error Handling:**
 - Introduce better error handling to reset the system state when errors occur, ensuring the user can continue without interruption

6. Quantitative Evaluation:

Although the responses are given as descriptive categories rather than plain numbers, you can assign them numerical values for the analysis (e.g., 1 = "No Control,"

2 = "Little Control," 3 = "Some Control," 4 = "Mostly in Control," 5 = "Full Control"). This conversion enables to compare means or medians using a standard statistical technique.

1. Data Collection & Preparation:

- **Question Details:**
This question is answered on a Likert scale (e.g., 1 = Not Understand at All, 5 = Understand Well).
- **Groups to Compare:**
For instance, *I compare the mean scores between two independent groups:*
 - **Frequent digital game players** (e.g., those who play almost daily)
 - **Occasional digital game players** (e.g., those who play 1–2 times a week)
- **Data Coding:**
Assign numerical values (1 to 5) to responses.

2. Choosing an Analysis Technique:

- **Parametric Test:**
If the Likert scale data is roughly normally distributed (which is sometimes assumed for Likert items if the sample size is sufficiently large), we can use an **Independent Samples t-test** to compare the means of the two groups.
- **Non-Parametric Test:**
If the data does not meet the assumptions of normality (which can happen with small sample sizes or ordinal data), the **Mann-Whitney U test** would be more appropriate as it compares the medians between groups.

Test Selection Justification:

- Given the small sample size and the ordinal nature of the data (Likert scale responses), the *Mann-Whitney U* Test is the most appropriate for comparing the control levels between the two groups.

3. Performing the Test and Results

Using the **Mann-Whitney U Test**, we compared the control levels between **Frequent Digital Game Players** and **Occasional Digital Game Players**. The test was executed in Python, and the results were as follows:

- **U-statistic:** 3.5
- **p-value:** 0.682

4. Interpretation of Results

The **p-value** of **0.682** is much higher than the significance threshold of **0.05**. This indicates that there is **no statistically significant difference** between the control levels experienced by the two groups. In other words, whether participants are frequent or occasional digital game players, their perceived control over the game is similar.

5. Conclusion

Since the p-value is greater than 0.05, we **fail to reject the null hypothesis**, which means there is no significant difference between the two groups in terms of their perceived control over the game.

Insights and Suggestions for Improvement:

- **No significant difference** in perceived control suggests that both frequent and occasional players experienced similar levels of control while playing the game. This could indicate that the game's mechanics and design were effective for players of different experience levels.
- However, there is still room for improvement in ensuring that all players feel they have full control. Feedback mechanisms and adjustments to voice recognition could help improve the overall experience, particularly for players who experience some degree of unpredictability or unresponsiveness.

Next Steps:

If more data were available, we could repeat the analysis with a larger sample size to see if any more significant differences emerge. Additionally, tracking user behavior within the game (e.g., response times, success rates) could provide more granular insights into how control is perceived by different groups.

7. Heuristic Accessibility Evaluation:

A **heuristic accessibility evaluation** is an expert-based assessment method used to identify potential usability and accessibility issues in a user interface (UI) design. It involves evaluating the system based on a set of established heuristics, which are general guidelines or principles aimed at improving the user experience. In this case, I will use the **10 Nielsen Heuristics for User Interface Design** as the standard set for evaluation. These heuristics cover essential aspects of usability that also apply to accessibility in digital interfaces.

1. Visibility of System Status

- **Heuristic:** The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
- **Evaluation:**
The wireframe includes basic feedback mechanisms, such as confirmation of actions and visual cues. However, there may not be immediate feedback for every action, especially for users with motor disabilities who may not receive prompt responses to their inputs.
- **Suggestion:**
For improved accessibility, add **visual cues** and **auditory feedback** (for those with visual impairments) after each action to confirm that the system is processing the user's input. Additionally, allow users to customize the speed and intensity of feedback to suit their needs.
- **Reference:** Nielsen, J. (1994). *Usability Engineering*. Morgan Kaufmann.

2. Match Between System and the Real World

- **Heuristic:** The system should speak the user's language, with words, phrases, and concepts familiar to the user, rather than system-oriented terms.
- **Evaluation:**
The wireframe uses clear, concise language and avoids jargon. The terms used are relatable to the target audience. However, in some areas, especially for first-time users or those unfamiliar with digital games, the interface could be more intuitive.
- **Suggestion:**
Improve the terminology for accessibility features, such as replacing ambiguous terms like "interactive" with specific actions, like "click to start," "drag to select," or "voice command available."
- **Reference:** Nielsen, J. (1994). *Usability Engineering*. Morgan Kaufmann.

3. User Control and Freedom

- **Heuristic:** Users should be able to easily undo or redo actions and feel in control of the interface.
- **Evaluation:**
While the wireframe allows users to proceed at their own pace, the current interface is easily accessible "back" or "undo" function, which is important for users with cognitive disabilities who may wish to retrace their steps.
- **Reference:** Nielsen, J. (1994). *Usability Engineering*. Morgan Kaufmann.

4. Consistency and Standards

- **Heuristic:** The system should follow platform conventions and maintain consistency in terms of design and terminology.
- **Evaluation:**
The wireframe maintains a consistent design but could improve its adherence to standard accessibility conventions. For example, some buttons may lack consistent labeling or visual affordances for screen readers.
- **Suggestion:**
Standardize button labels (e.g., "Play," "Pause," "Settings") and ensure that all interactive elements are properly labeled for **screen readers**. This would benefit users with visual impairments and enhance consistency.
- **Reference:** Nielsen, J. (1994). *Usability Engineering*. Morgan Kaufmann.

5. Error Prevention

- **Heuristic:** The system should be designed to prevent errors from occurring, rather than providing error messages.
- **Evaluation:**
The wireframe currently provides some error prevention (e.g., asking for confirmation before submitting). However, in certain areas, users may accidentally trigger actions or make errors without clear guidance.
- **Suggestion:**
Implement **confirmation dialogs** and more explicit instructions to guide users, especially when errors could be more common (e.g., for voice commands). Additionally, offer suggestions or corrections to users when a command is not recognized.
- **Reference:** Nielsen, J. (1994). *Usability Engineering*. Morgan Kaufmann.

6. Recognition Rather than Recall

- **Heuristic:** Minimize the user's memory load by making objects, actions, and options visible.
- **Evaluation:**
The wireframe includes most of the essential options on the main screen.
- **Reference:** Nielsen, J. (1994). *Usability Engineering*. Morgan Kaufmann.

7. Flexibility and Efficiency of Use

- **Heuristic:** The system should cater to both novice and experienced users by offering shortcuts or accelerators.
- **Evaluation:**
The wireframe doesn't currently provide any customizable features or shortcuts for experienced users. While it's user-friendly for beginners, advanced users might find it slow and inefficient.
- **Suggestion:**
Offer **customizable controls** and **shortcuts** for experienced users, which would also benefit users with motor impairments who need more efficient navigation options.
- **Reference:** Nielsen, J. (1994). *Usability Engineering*. Morgan Kaufmann.

8. Aesthetic and Minimalist Design

- **Heuristic:** The design should not contain irrelevant or rarely needed information and should focus on simplicity.
- **Evaluation:**
The wireframe is visually clean, but the layout can be made even more minimalist. Some sections may present an overwhelming amount of information at once, which could confuse users with cognitive disabilities.
- **Suggestion:**
Simplify the layout by reducing the number of choices on each screen and using **collapsible menus** to make the interface less cluttered.
- **Reference:** Nielsen, J. (1994). *Usability Engineering*. Morgan Kaufmann.

9. Help Users Recognize, Diagnose, and Recover from Errors

- **Heuristic:** The system should provide helpful error messages that suggest solutions when something goes wrong.
- **Evaluation:**
The wireframe does not currently provide sufficient error messages or recovery options for users who encounter issues, such as with voice command recognition.
- **Suggestion:**
Add **clear error messages** with possible solutions. For example, if the system does not recognize a voice command, suggest an alternative phrasing or ask the user to try again.
- **Reference:** Nielsen, J. (1994). *Usability Engineering*. Morgan Kaufmann.

10. Help and Documentation

- **Heuristic:** Even though the system should be usable without documentation, it may still need help and documentation.
- **Evaluation:**
The wireframe does not include any form of help documentation, which may be essential for users unfamiliar with the interface or those with cognitive disabilities.
- **Suggestion:**
Provide an accessible **help section** that explains common tasks and provides troubleshooting information in both **text and voice formats**.
- **Reference:** Nielsen, J. (1994). *Usability Engineering*. Morgan Kaufmann.

References

- **Brooke, J. (1996).** *SUS: A Quick and Dirty Usability Scale*. In: Usability Evaluation in Industry. Morgan Kaufmann.
 - https://www.researchgate.net/publication/319394819_SUS_a_quick_and_dirty_usability_scale
Used as a foundational measure of usability in many HCI studies.
- **Carroll, J. M. (2000).** *Making Use: Scenario-Based Design of Human-Computer Interactions*. MIT Press.
 - MIT Press: <https://mitpress.mit.edu/9780262513883/making-use/>
Supports stakeholder justification (e.g., Academic Module Leader/Client) and design rationale.
- **Gulliksen, J., et al. (2003).** *Key Principles for User-Centered Systems Design*. Behaviour & Information Technology, 22(6), 397–409.
 - <https://www.tandfonline.com/doi/abs/10.1080/01449290310001624329>
Helps justify the design decisions for accessibility and usability.
- **ISO 9241-11 (2018).** *Ergonomics of Human-System Interaction – Part 11: Usability: Definitions and Concepts*. International Organization for Standardization.
 - <https://www.iso.org/obp/ui/#iso:std:iso:9241:-11:ed-2:v1:en>
Supports non-functional requirements regarding usability and learnability.
- **Juul, J. (2005).** *Half-Real: Video Games between Real Rules and Fictional Worlds*. MIT Press.
 - https://www.academia.edu/3488833/Half_Real_Video_Games_between_Real_Rules_and_Fictional_Worlds_Jesper_Juul
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Appendix

Transcript 1

8 April 2025, 01:30pm

Hajar Nefaa started transcription

□

Mohamed Sheekh 0:04

MS

Yep, it's recording now.

Hajar Nefaa 0:07

HN

Yep.
OK.

Can you describe your experience playing the game?

Mohamed Sheekh 0:19

MS

Yeah, I think your game games narrative, your games, gameplay, your games technical and your voice command were pretty good. I like the different levels that they have. I like the storyline of the game and how it goes into different levels after you complete the first one.

I think overall I enjoyed the game. It was, it was really good.

Hajar Nefaa 0:41

HN

Thank you. Where there are parts of the game that you found confusing or difficult to navigate.

Mohamed Sheekh 0:51

MS

In one stage when I was doing the maze, the voice command didn't work in the the Voice command wasn't as efficient as the other levels, but overall the I didn't find anything else that was difficult. So overall I'd rate it if I had to rate, I'd rate it now nine out of 10 in terms of there wasn't any difficult parts or any confusing parts. I would say that particularly had me struggling and because also you have touched functionality, you didn't really have.

It didn't really trouble me too much.

Hajar Nefaa 1:20

HN

OK, how did the accessibility feature like visual elements button?
Voice recognition impacted your experience.

Mohamed Sheekh 1:31

MS

I think the visibility and the voice recognition and the voice command went hand in hand. I think it's the voice command had expected me to say something and if it didn't, if I didn't say what it expected me to say, it wouldn't work. Of course, because that's exactly how voice commands meant to work. And when I did say exactly what they wanted me to say, the feedback and the voice command would do exactly what I wanted to do. So in terms of the voice command, I wouldn't say that there was anything.
There wasn't anything that I would that didn't work.
It was pretty, it was pretty solid.

Hajar Nefaa 2:05

HN

And what do you think about the way the Riddle are presented and answered?

Mohamed Sheekh 2:12

MS

It was. It was very interesting to see it was. It was a very different approach and a very brave approach by you as a developer, but I enjoyed it a lot. I think the riddles had a bit of fun side to it. Also whilst keeping the game very professional. But also voice command works in hand in hand with it, so I couldn't agree more that it was. It was going well.

Hajar Nefaa 2:35

HN

And what about the feedback provided, like the hands for the Riddle, the visual and haptic responses, the vibrational set?

Mohamed Sheekh 2:45

MS

It was. It was. At first it was kind of surprising. I didn't expect the haptic response to be as well as it was, but. I think it was overall generally the game and the haptic responses and the voice command worked pretty well.

Hajar Nefaa 3:04

HN

Did the the hands work fine for the rails?

Mohamed Sheekh 3:08

MS

I didn't get that far in the game, unfortunately.

Hajar Nefaa 3:10

HN

OK.
Would you recommend any improvements or additional features?

Mohamed Sheekh 3:19

MS

I think maybe the colour consistency so the white background in the maze maybe should be the same colour as the the overall game pig. I think the setting of the tone should be exactly that, but that's obviously me nitpicking the game with overall was really really good. I enjoyed it a lot but if I had to pick one thing is probably like the consistency and colour. Other than that the technical side of the functionality of the game and the.
And the haptics were pretty solid and that's exactly what you look for in a game.

Hajar Nefaa 3:50

HN

Yeah. Do you think the the game meets its goal of being accessible and engaging? Why or why not?

Mohamed Sheekh 3:58

MS

Definitely.
Definitely, definitely the game. Definitely the game's definitely accessible because firstly it gives you the voice command and it also gives you the touch touch functionality which also targets different people, disabilities as well as the hearing which is outlined and the mood to impairments. So the ability to have touch functionality and also to have voice command, it definitely targets targets of both of the disabilities. So on that part I did really well in terms of this engagement of the game, I think the that's exactly what separates.
All the other games I've played, the engagements of the game, as well as the functional side of the game go hand in hand, and it was pretty much very seamless.

I enjoyed it a lot. I think the narrative was something that it's very different. Also another brave approach, but I enjoyed it a lot. I think it was very good.

Hajar Nefaa 4:50

HN

I'm comfortable with it using the Voice Command feature.

Mohamed Sheekh 4:55

MS

I think other than, as I said in the maze part, I think it struggled only once, but other than that I didn't. I didn't have any bad experiences with the voice command in terms of the game. So overall I'd give it a solid.

Hajar Nefaa 5:11

HN

And how did you feel like emotionally during the gameplay? Like excited, frustrated, confused or maybe during some part of the game?

Mohamed Sheekh 5:20

MS

OK, to pay this, I think that when I first reached the first page where it tells you to pick your character, I was very excited. I enjoyed it quite a bit, but when I didn't see the character evolve into different parts of the game, I was kind of sad a little bit because I wanted to see the character and the storyline carry on. But obviously when you have the maze and that you decided, well, maybe that's because I wasn't good enough at the game, but it definitely gives you the engagement that you're looking for so that you keep coming back to the game because you want to beat all the levels and get to the final stage. As, as I said before, it's very it's very engaging. So it makes you.

Kind of addictive towards a game, but it was very good. I enjoyed it a lot.

Hajar Nefaa 6:04

HN

And it was the instructions that was given at the beginning clear enough to get started.

Mohamed Sheekh 6:10

MS

I think they couldn't be more any clear. It was as clear as day I think if anyone struggled to have if anyone struggled with the instructions, I think it's just them not reading the stress as well. I think the constructs were very, very clear.

Hajar Nefaa 6:22

HN

OK. Thank you. That's all.

Mohamed Sheekh 6:24

MS

Perfect. Thank you very much. I enjoy the game. Enjoy your games. Very good, Alexa. No worries.

Hajar Nefaa 6:25

HN

Yeah.

Thank you so much.

Thank you. I'll stop the recording now.

Hajar Nefaa stopped transcription



Transcript 2

8 April 2025, 03:35pm

Hajar Nefaa started transcription



Hajar Nefaa 0:06

HN

OK, it's recorded.

Shashank Ramesha 0:09

SR

OK.

Hajar Nefaa 0:12

HN

Oh, my first question will be.
Can you describe your experience playing the game?

Shashank Ramesha 0:22

SR

Experience was really good.
The effort taken to build the game was a lot.
The user interface was really about the layout.
And the images.
So it was.
In conclusion, it was good, yeah.

Hajar Nefaa 0:45

HN

Were there, were there parts or any parts of the game that you found confusing or difficult to navigate?

Shashank Ramesha 0:55

SR

I think it was during the Riddle where I had to answer after one wrong answer. I was not able to.
Forward. I don't know what the issue was and the other one was the maze. I was not able to view it completely on my phone.
Those two things were confusing.

Hajar Nefaa 1:20

HN

How did the game's accessibility feature like the visual elements buttons, voice recognition impacted your experience?

Shashank Ramesha 1:30

SR

They were really good.
If the good part was the buttons, if the voice didn't work, buttons as a second option, it really worked well.
And yes, it was good.

Hajar Nefaa 1:48

HN

What do you think about the way the results are presented and answered?

Shashank Ramesha 1:55

SR

Riddle, right?

Hajar Nefaa 1:57

HN

Yeah.

Shashank Ramesha 1:59

SR

The user interface was good.
The problem was that the voice recognition wasn't working I think.
If it would be possible, you know, to display what the user said, it would be easy for us to like know that we are saying the right thing or not. If it's recording or not.

Hajar Nefaa 2:21

HN

OK.
If you encounter difficulties, what strategies did you use to overcome them?

Shashank Ramesha 2:32

SR

The difficulty was the voice recognition, but you've already provided a solution for that, which was with the buttons, so it was easy to navigate.

Hajar Nefaa 2:44

HN How did you feel about the feedback provided? Like hands, visual or haptic responses, the vibration and stuff?

Shashank Ramesha 2:59

SR I didn't get any vibrations, but the visual feedback was really good. It was really immersive. The story lies and it's interesting. The character selection, the riddles. It was good.

Hajar Nefaa 3:15

HN Do you recommend any improvements or additional features?

Shashank Ramesha 3:21

SR Like I said, like maybe display what the user said so that the user knows that the voice recognition is working, or maybe you should say it a bit more clear.

And I don't know if it might be the problem in my phone, but I was not able to view the entire maze game, so I was not able to move after a few steps.

Hajar Nefaa 3:46

HN Not because it's supposed to. It was you didn't Sprite and I think I put the like the walls for the maze based on my phone and it says it. I expected that.

Shashank Ramesha 3:46

SR Those two are the two improvements.

OK, OK.

OK. Yeah, that could, yeah. OK, yeah.

Hajar Nefaa 4:03

HN Do you think the game meets its goals of being accessible and engaging? Why or why not?

Shashank Ramesha 4:08

SR It does. It does.

Hajar Nefaa 4:11

HN Why do you?

Shashank Ramesha 4:11

SR It does.

It.

It is accessible to people with motor impairments and hearing impairments as voice recorded and if not as a second option, there's buttons as well to navigate, so it does.

Hajar Nefaa 4:33

HN And how comfortable will you were you using the Voice command feature?

Shashank Ramesha 4:41

SR On a scale of one to five would say around 4:00 except.

During the rental, I was able to use it. I was working properly, was working perfectly.

Hajar Nefaa 4:53

HN Yeah. And how did you feel emotionally during the gameplay like?

Excited any frustration or confused.

Shashank Ramesha 5:03

SR The storyline was fascinating. You put in a lot of efforts to build a game.

A lot of different elements in it, different types of games. In this like Riddle maze.
So yeah, it was good.

Hajar Nefaa 5:22

HN

Instructions that was given at the beginning clear enough to get started.

Shashank Ramesha 5:28

SR

Yes, the instructions in every scheme was very clear.
It was easy to understand on how to play the game.

Hajar Nefaa 5:36

HN

K, Thank you so much. That's all the questions for today. I'll stop the recording.

Hajar Nefaa stopped transcription

