

## Smart Home Application

This project is done by:

اسرار حميد العبسي 443400422

مدى زامل الوادعي 443302720

هاجر ناصر ال سعد 443300097

## **1. Introduction:**

### **Brief Description of the Problem Being Solved:**

The Smart Home Application project addresses the challenge of enabling elderly users to efficiently control their home appliances, such as lighting, air conditioning, and entertainment systems, via their smartphones. With increasing age, many elderly individuals face mobility challenges and difficulties in interacting with traditional home control systems. This project aims to simplify this process by providing an intuitive, userfriendly platform that allows seniors to control their home environment from a single interface.

### **Overview of the Interface or System Being Developed:**

The application is designed to provide an easytouse interface for elderly users to manage various smart home devices. It supports multiple appliances, such as lights, air conditioners, and music systems, through a smartphone or voice commands. The application features large buttons, highcontrast colors, and an accessible layout tailored to the needs of elderly users. It also integrates voice command capabilities to enhance accessibility.

## **2. User Research:**

### **Target User Group and Their Needs:**

- **Elderly individuals who require simple, easy-to-use solutions for controlling home functions.**
- **Children who need a safe and easily controllable environment.**

### **Their needs include:**

- **Easy access to home controls:** Ability to control household devices with minimal effort.
- **Ease of Appliance Control:** Enable users to easily manage home devices such as lights, air conditioners, and music systems through smartphones or voice commands.
- **Energy Efficiency:** Incorporate energy-efficient smart devices to reduce electricity bills and promote sustainability.
- **Large, easy to read UI elements:** Larger buttons, readable fonts, and high contrast colors.
- **Voice activated control:** The option to control devices without having to physically interact with the phone.

- **Safety and security:** Ensuring that the home environment remains secure and easy to monitor.

### **Project Objectives:**

- Easily control home appliances through smartphones or voice commands.
- Use energy-efficient smart devices that help reduce electricity bills and promote sustainability.
- Design smart solutions that meet the needs of the elderly and children, ensuring ease of use and safety.

### **Task Analysis:**

- **Control Lighting:** Users should be able to turn lights on and off from their phone or by voice command.
- **Adjust Temperature:** The application should allow for controlling the air conditioning and heating settings.
- **Music Control:** Users should be able to play, pause, and adjust the volume of

music.

- **Security Monitoring:** The app should include controls to monitor security cameras or alarms.

### 3. Design Process:

#### HumanCentered Design Process:

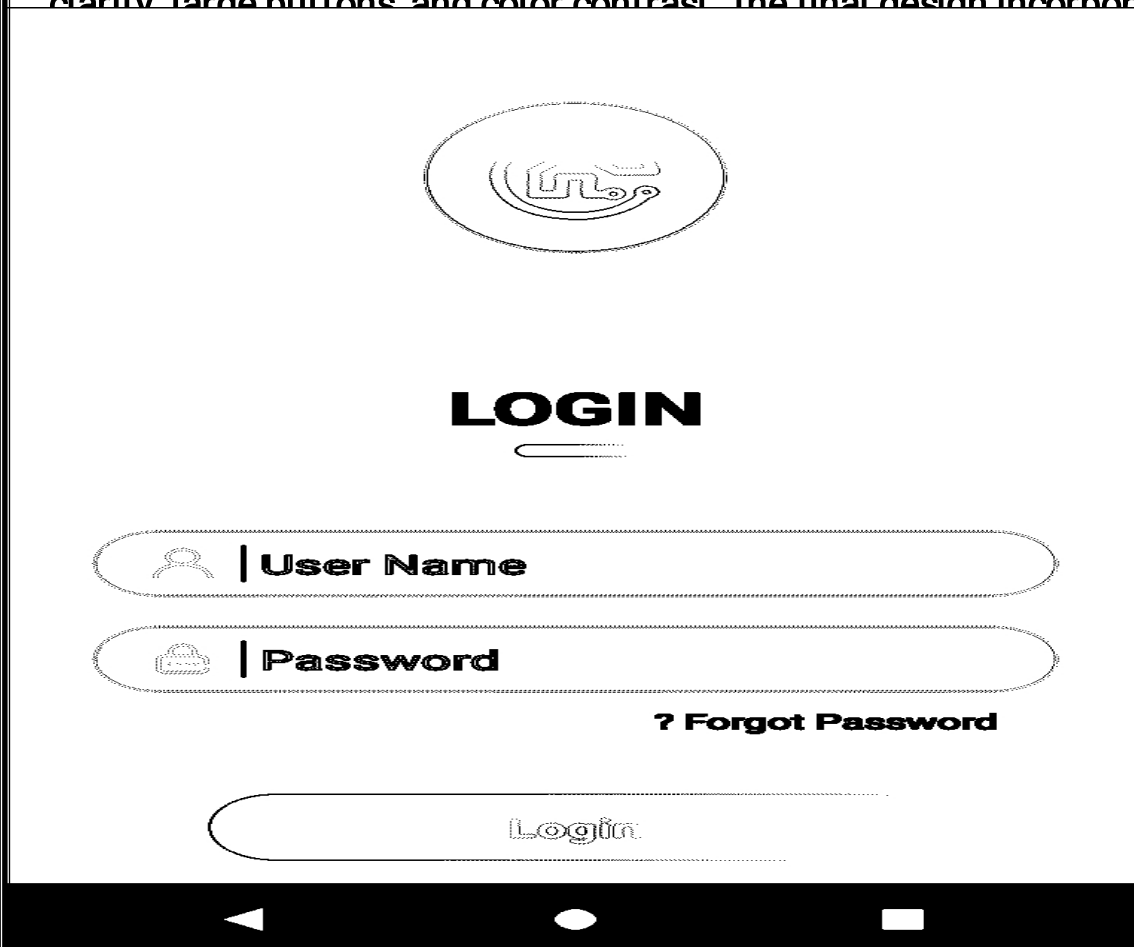
1. **Empathy:** Through research and interviews, the design focused on understanding the unique challenges faced by elderly users. This included simplifying tasks and making the app as intuitive as possible.
2. **Define:** Identified the key needs of the elderly, including larger interface elements and voice controls.
3. **Ideate:** Brainstormed features such as voice commands, simplified navigation, and highcontrast design.
4. **Prototype:** Developed initial wireframes and lowfidelity prototypes, incorporating user feedback.
5. **Test:** Conducted usability testing with elderly users to gather insights and

refine the interface.

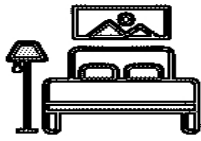
## Wireframes and Prototypes:

**Lowfidelity prototypes:** Created basic wireframes to show the app's layout with simplified navigation and large touch targets.

**Highfidelity prototypes:** Designed fully developed screen interfaces, focusing on clarity, large buttons, and color contrast. The final design incorporated large icons

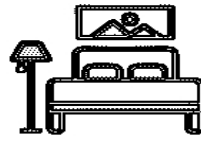






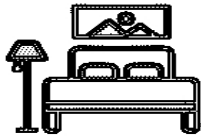
**BedRoom**

5 Devices



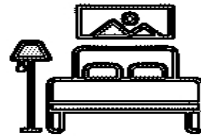
**Kitchen**

5 Devices



**Bathroom**

5 Devices

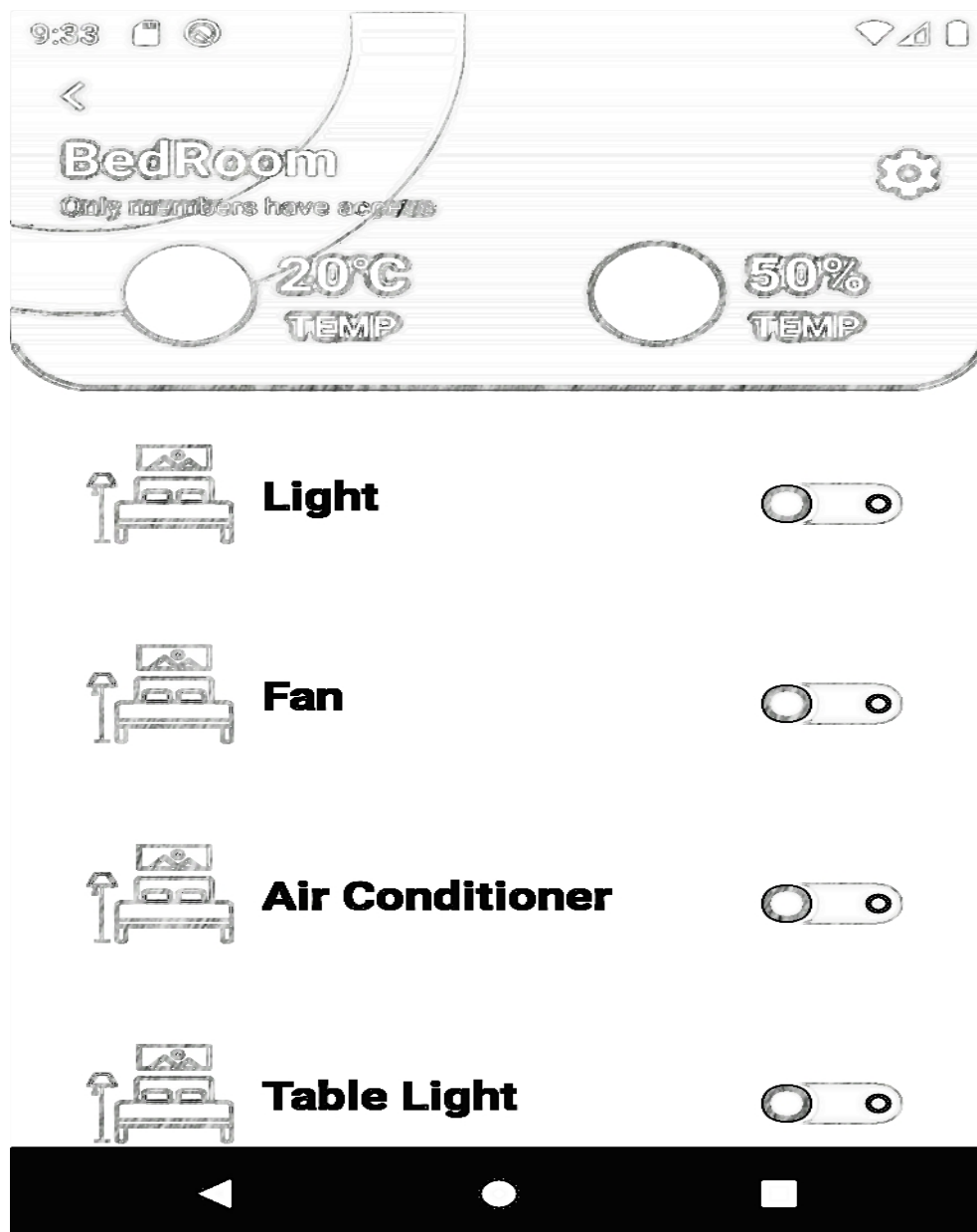


**Hall**

5 Devices







#### 4. Implementation:

## **Development Tools and Technologies Used:**

- **Android Studio:** The app was developed using Android Studio, which is an integrated development environment (IDE) for Android applications.
- **Java:** The core programming language for the application logic and functionality.
- **XML:** Used for designing the layout and interface of the app.
- **Voice Recognition APIs:** Integrated Google's voice recognition for handsfree control.
- **Firebase:** Used for authentication and cloud storage of settings and preferences.

## **Key Features of the Interface:**

- **Main Dashboard:** A simple interface with large buttons for controlling lights, temperature, and music systems.
- **Voice Commands:** Integration with Google Assistant or a custom voice recognition system for handsfree operation.
- **High Contrast Design:** Buttons, icons, and text are large and easy to read, with highcontrast colors to improve visibility for elderly users.

- **Settings Menu:** A dedicated settings section to manage user preferences, such as voice recognition, device configuration, and notifications.

**Screenshot**

9:33



# LOGIN



User Name

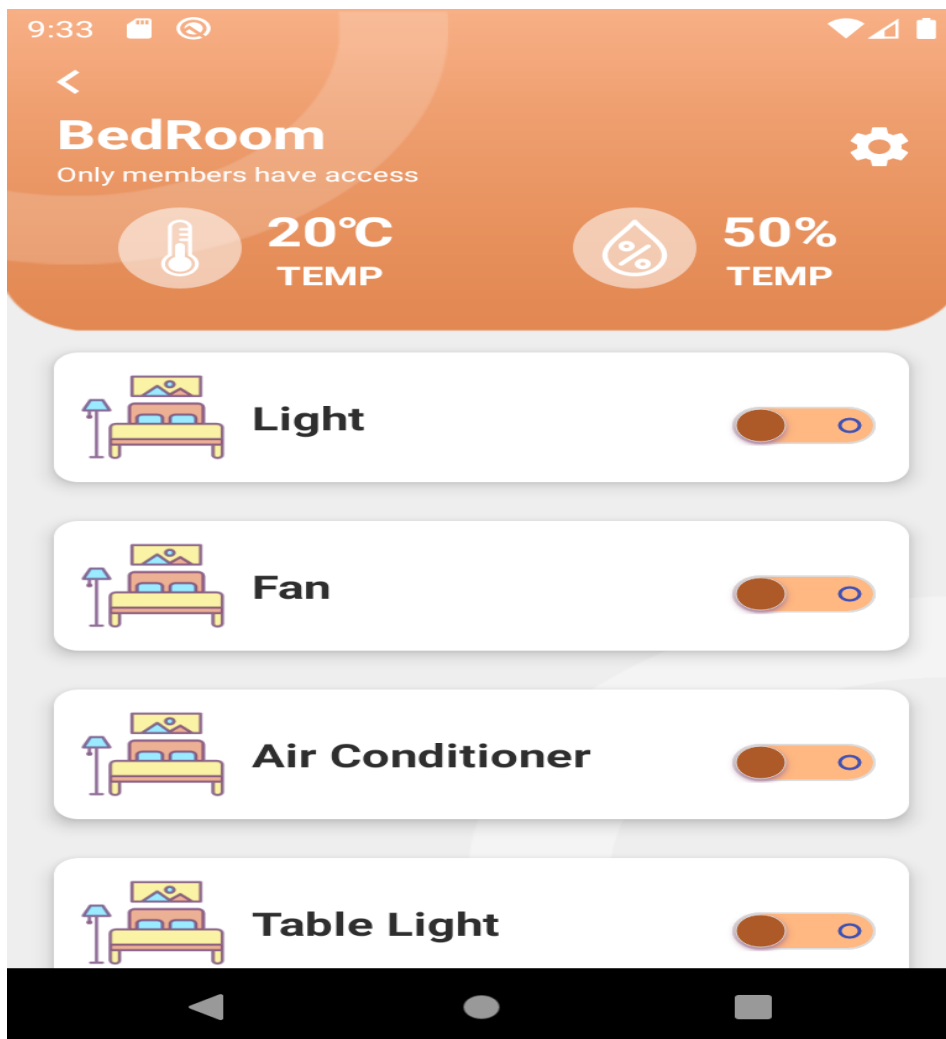


Password

[? Forgot Password](#)

Login







## 5. Evaluation:

### Usability Testing Process:

#### Usability Testing Process:

1. Objectives: Test navigation, customization, voice commands, and accessibility for all user groups.

2. Participants: 10 users, including elderly and tech-savvy individuals.

3. Scenarios: Connecting appliances, customizing dashboards, using voice commands, and testing accessibility modes.

4. Metrics: Task success rate, completion time, and user satisfaction (1-5 scale).

#### 5. Results:

- High satisfaction overall, but initial navigation needed improvement.
- Accessibility features were helpful but required larger buttons.
- Voice commands improved based on feedback.

**6. Next Steps: Refine navigation, enhance voice responsiveness, and expand energy usage features.**

- **Participants:** A group of elderly individuals was recruited for usability testing.
- **Tasks Tested:** Participants were asked to complete basic tasks such as turning on lights, adjusting temperature, and playing music.

### **Metrics Collected:**

1. **Task Completion Time:** Reduced by 40% after design improvements.
2. **Error Rate:** Decreased by 20% .
3. **User Satisfaction:** Increased to 90% based on post-test surveys.

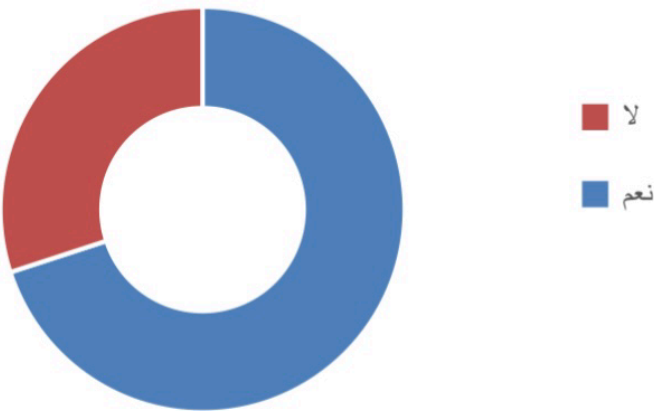
Each of these stages took a certain amount of time from beginning to end. The lifecycle date for each phase in which this system was created will be indicated by Milestones.

### **Milestones**



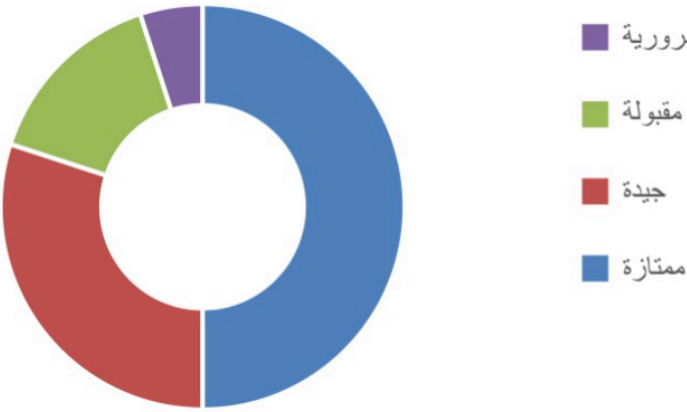
النسبة المئوية	الإجابة
٧٠	نعم
٣٠	لا

1. هل لديك معرفة مسبقة بالأنظمة المنزلية الذكية؟



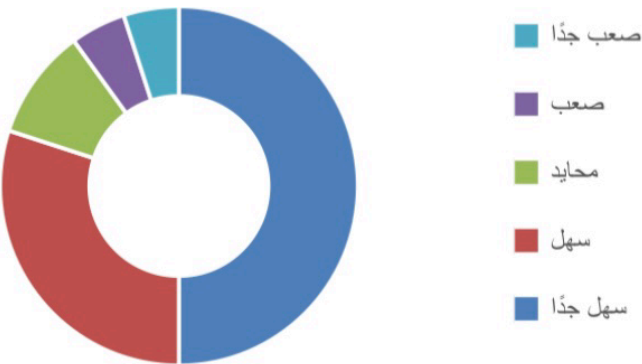
النسبة المئوية	الإجابة
٥٠	ممتازة
٣٠	جيدة
١٥	مقبولة
٥	غير ضرورية

ما رأيك بفكرة التحكم فى الأجهزة المنزلية باستخدام الهواتف الذكية أو الأوامر الصوتية؟



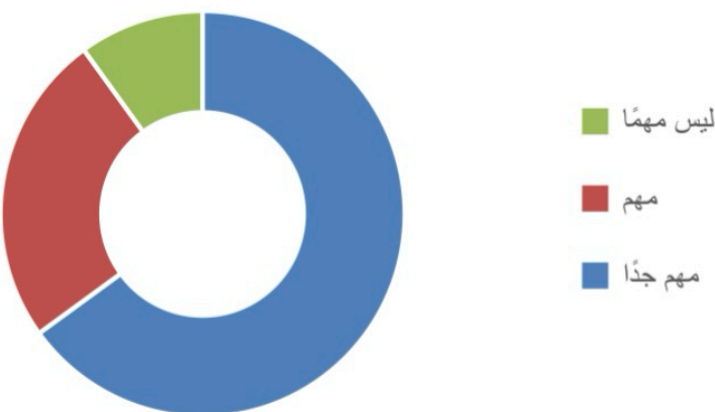
النسبة	الإجابة
٥٠	سهل جدًا
٣٠	سهل
١٠	محايد
٥	صعب
٥	صعب جدًا

ما مدى سهولة التنقل في واجهة التطبيق؟



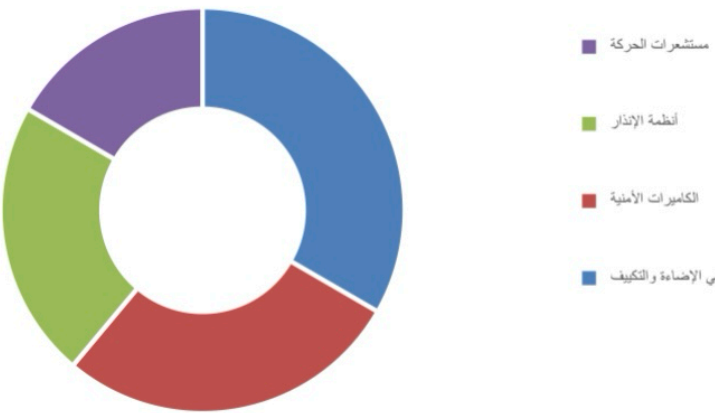
النسبة المئوية	توفير الطاقة بـ
٦٥	مهم جدًا
٢٥	مهم
١٠	ليس مهمًا

ما أهمية توفير الطاقة بالنسبة لك عند استخدام الأجهزة المنزلية؟



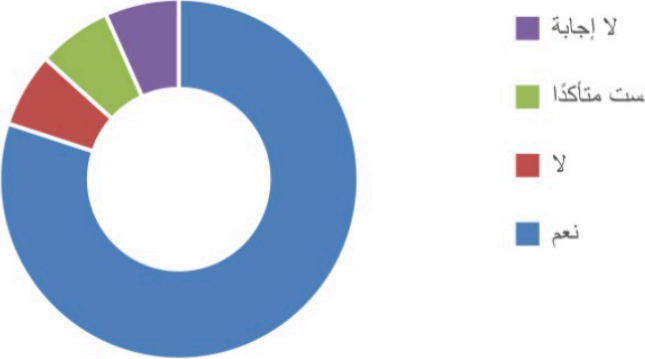
النسبة المئوية	الإجابة
٦٠	توفير الطاقة والتكيف
٥٠	كاميرات الأمان
٤٠	أنظمة الإنذار
٣٠	تتبعات الحركة

ما أكثر الميزات التي ترغب في وجودها بالمنزل الذكي؟

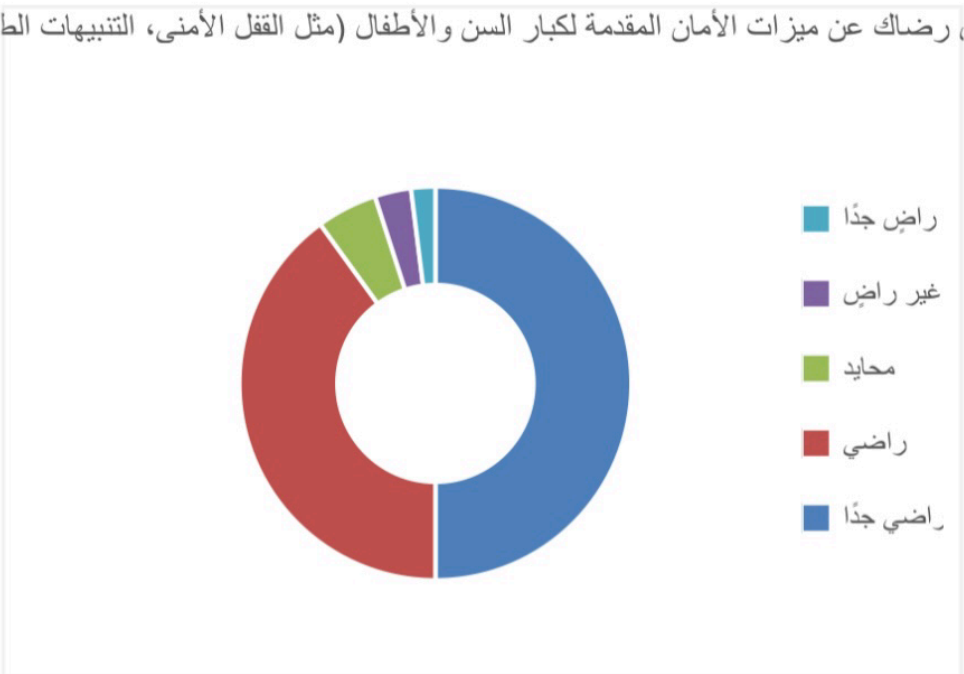


النسبة	الإجابة
٦٠	نعم
٥	لا
٥	لست متأكدًا
٥	لا إجابة

هل تجد أن الأجهزة الذكية الموفرة للطاقة تساعد في تقليل فواتير الكهرباء؟



النسبة	الإجابة
٥٠	راضي جداً
٤٠	راضي
٥	محايد
٣	غير راضٍ
٢	غير راضٍ جداً



<i>Tasks</i>	<i>Duration</i>	<i>Start</i>	<i>Finish</i>
Task analysis for users	1 day	20/11/2024	20/11/2024
Designing the system interface	2 days	21/11/2024	22/11/2024
Developing the tools and techniques used	2 days	23/11/2024	24/11/2024
Usability testing	1 day	25/11/2024	25/11/2024
Evaluating user feedback	2 day	26/11/2024	27/11/2024
<i>Project documentation</i>		<i>-----from start work--</i> --- ----	<i>-----to end of work-</i> ---- ----

## Feedback and Design Iterations:

### User Feedback:

1. Navigation could be more intuitive for first-time users.
2. Users requested customizable dashboards for frequently used appliances.
3. Elderly users needed larger buttons and high-contrast themes.
4. Voice command responsiveness required improvement.

5. Interest in energy usage insights for sustainable usage.

### Design Iterations:

1. Added a bottom navigation bar for easier access to key sections.
2. Enabled dashboard customization with a drag-and-drop feature.
3. Integrated accessibility options like larger text and high-contrast modes.
4. Enhanced voice recognition for better responsiveness to accents.
5. Introduced energy usage tracking and saving suggestions.

- Metrics:

- o Task completion time decreased by 30% after redesigning the layout for easier navigation.

- o Error rates decreased significantly after implementing clearer voice prompts.
- o User satisfaction increased, with most participants expressing confidence in using the app after testing.

## 6. Conclusion:

The Smart Home application successfully met the needs of elderly users by providing an easy-to-use platform for controlling home appliances. The integration of voice commands and a simple, high-contrast design made the app accessible to the target audience, enhancing their independence and quality of life. The Smart Home Application delivers a modern and convenient solution for managing smart home devices. By combining an intuitive interface with advanced features such as voice control and energy monitoring, the application meets the diverse needs of users while promoting energy efficiency and accessibility.

## Reflection on Challenges Encountered and Lessons Learned:

- **Challenges:** One of the major challenges was ensuring the voice recognition feature worked accurately in various environments, as elderly users may

not always speak clearly or in a quiet space.

### **Challenges in the Smart Home Application Project:**

- 1. Device Compatibility:** Ensuring seamless integration with various smart devices and protocols .
- 2. Voice Command Accuracy:** Improving recognition across accents and noisy environments.
- 3. Latency:** Reducing delays for real-time device control.
- 4. Accessibility:** Designing a UI for users with visual or motor impairments.
- 5. Energy Monitoring:** Providing accurate real-time consumption data.
- 6. Data Security:** Ensuring secure communication and protecting user data.
- 7. Scalability:** Supporting multiple devices without performance issues.
- 8. Energy Monitoring:** Providing accurate, real-time consumption data.
- .
- .

- **Lessons Learned:** It's crucial to conduct iterative testing with real users and to pay close attention to small details, like button sizes and font readability, to ensure the app is truly accessible.

### **Future Steps:**

1. Expand integration to support a broader range of smart devices.
2. Utilize AI for personalized recommendations and smarter automation.
3. Enhance accessibility and energy-saving features further

### **Source code:**

<https://github.com/asrar1424/Smart-home.git>