

AI base Alzheimer care and Cognitive Support Mobile App.

Project ID: 24-25J 304

Project Proposal Report

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B.Sc. (Hons) Degree in Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology

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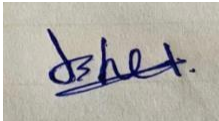
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DECLARATION

We declare that this is our own work, and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Candidate Name	Student ID	Signature
Madhusanka J.A. A	IT21215292	

The above candidates are carrying out research for the undergraduate Dissertation under my supervision.



.....
Signature of the supervisor

(Mrs. Uthpala Samarakoon)

23/08/2024

.....
Signature of the co-Supervisor

(Ms. Poorna Panduwawala)

23/08/2024

Abstract

The goal of this research is to create an AI-powered smartphone application that improves Alzheimer's care and cognitive support for patients, carers, and clinicians. Alzheimer's disease, which is characterized by cognitive deterioration, presents substantial obstacles in patient treatment, particularly in early detection and continued monitoring. Current systems frequently lack real-time analysis, tailored care recommendations, and user-friendly tools for non-expert carers. This research aims to fill these gaps by utilizing AI technologies including real-time voice analysis, cognitive evaluation tools, and personalized learning paths.

The study will involve designing and implementing a mobile application with features such as real-time speech analysis to detect early signs of cognitive decline, AI-powered cognitive assessment tools, and an AI assistant that provides social interaction prompts and personalized Alzheimer's care recommendations. The software will also prioritize data protection and security, ensuring that patient information is safe. To increase user engagement, the app will deliver real-time feedback and allow users to customize their cognitive workouts based on their performance. The study will follow a development lifecycle that includes requirements gathering, design, programming, testing, and deployment, as well as ongoing user feedback loops to improve features and functionality.

This novel technique stands out from previous research by providing a comprehensive, real-time, and personalized Alzheimer's care tool that incorporates numerous AI-powered features. This software, which focusses on ease of use and accessibility, will enable carers and physicians to better manage and monitor the progression of Alzheimer's disease, resulting in more prompt interventions and better patient outcomes. The projected conclusion is a scalable, user-friendly program that dramatically improves the quality of care delivered to Alzheimer's patients, thereby setting a new bar for AI integration in healthcare.

Keywords:

This study focusses on Alzheimer's disease and specifically addresses the difficulties patients have adhering to everyday routines as a result of memory loss and cognitive deterioration. It looks at how assistive technologies, like visual and audio reminders, can help with daily care and improve patients' quality of life. The study also highlights the significance of carer assistance and the requirement for an approachable, comprehensive system that incorporates regular management tools and memory aids. The research seeks to enhance aged care and encourage patient independence by focussing on these areas.

Acknowledgement

This is to express my sincere gratitude to you for all of your help and advice when I put together my research proposal. I could not have submitted this proposal without your experience and willingness to share your knowledge.

I would like to express my sincere appreciation to my supervisor Mrs. Uthpala Samarakoon, and co- supervisor Ms. Poorna Panduwawala for their invaluable guidance and support throughout the development of this research proposal. Their expertise and insights have been instrumental in shaping the direction of my study. I am also grateful to the research panel for their constructive feedback and valuable suggestions that have significantly enriched the content and methodology of this proposal. Finally, I would like to thank you again for all of your help and encouragement. As I proceed with this study project, I am looking forward to collaborating with you more.

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LIST OF ABBREVIATION

AD	Alzheimer's Disease
VA	Visual Aids
AR	Auditory Reminders
RM	Routine Management
MA	Memory Aids
CS	Caregiver Support

01. Introduction

"Impact of Visual and Auditory Reminders on Adherence to Daily Routines in Alzheimer's Patients," explores how technology can enhance the daily lives of individuals living with Alzheimer's disease by promoting adherence to their routines. Alzheimer's patients often face challenges in maintaining daily routines due to memory impairments, which can lead to missed appointments, medications, and other critical activities. This study aims to address these challenges through the innovative use of visual and auditory reminders, routine management tools, memory aids, a simplified interface, and caregiver integration.

The research emphasizes the importance of visual and auditory reminders as tools for supporting memory and routine adherence. Visual cues, including images, icons, and colors, are used to represent various events such as doctor appointments, family visits, and medication times. These cues are designed to be intuitive and easy for patients to recognize, helping them to stay on track with their daily activities. Complementing these visual aids are gentle auditory reminders that provide voice alerts to announce events. These auditory cues are intended to be soothing and clear, ensuring that patients are reminded of important tasks in a way that is both effective and non-intrusive.

Routine management is another critical aspect of the study. The research explores how daily schedules can be visually presented to patients, allowing them to see a clear outline of their day, including wake-up times, meals, medication, and bedtime. This visual schedule is not static; it adapts to changes in the patient's routine, providing flexibility and ensuring that the schedule remains relevant and supportive as their needs evolve.

In addition to routine management, memory aids play a significant role in the research. These aids offer contextual information for events, providing details about who, what, and why, which helps to reinforce the patient's memory. The inclusion of photos or short videos of family members or caregivers further personalizes these reminders, making them more meaningful and easier for the patient to understand.

A simplified interface is essential for ensuring that the technology is accessible to Alzheimer's patients. The study focuses on designing an interface with large buttons, clear text, and voice control options, allowing patients to interact with the system easily, even with cognitive impairments.

Finally, caregiver integration is a vital component of the research. The system allows caregivers to remotely manage the patient's schedule, adding, modifying, or deleting events as needed. Real-time updates and notifications ensure that caregivers are informed if a patient misses an event or medication, enabling timely interventions. This holistic approach seeks to improve the quality of life for Alzheimer's patients by providing a supportive, technology-driven solution to routine management.

1.1 Background and Literature Survey

"Impact of Visual and Auditory Reminders on Adherence to Daily Routines in Alzheimer's Patients" is rooted in the growing need for effective tools to manage the daily lives of individuals with Alzheimer's disease. Alzheimer's, a progressive neurological disorder, significantly impairs memory and cognitive function, making it challenging for patients to adhere to routines such as taking medication, attending appointments, and completing daily tasks. As the global population ages, the prevalence of Alzheimer's is increasing, amplifying the demand for innovative solutions that support patients in maintaining their independence and quality of life.

Existing literature highlights the critical role of routine in the lives of Alzheimer's patients. Studies have shown that consistent daily routines can help reduce anxiety and confusion in patients by providing a sense of structure and predictability. However, the cognitive decline associated with Alzheimer's often leads to difficulties in remembering and following routines. This has prompted researchers and developers to explore the use of assistive technologies that leverage visual and auditory cues to aid memory and routine adherence.

Previous studies have explored various technological interventions, including digital calendars, reminder apps, and wearable devices, which have shown promise in improving routine adherence among Alzheimer's patients. Visual cues, such as images and icons, have been found to be particularly effective in aiding memory recall, while auditory reminders, like voice alerts, offer additional support by providing real-time prompts.

However, there remains a gap in the literature regarding the integration of these tools into a holistic system that not only supports patients but also involves caregivers in the management process. This research aims to build on the existing knowledge by developing a comprehensive, user-friendly system that combines visual and auditory reminders with routine management, memory aids, and caregiver integration, thereby offering a more robust solution for enhancing adherence to daily routines in Alzheimer's patients.

1.2 Research Gap

While research has been done on the use of aural and visual reminders to help patients with Alzheimer's disease adhere to their daily routines, most current solutions only address a single facet of the issue. A comprehensive approach that integrates memory aides, routine management, carer assistance, and these reminders is lacking. By creating a more comprehensive and user-friendly system that combines all these components, this study seeks to close this gap and provide Alzheimer's patients with improved assistance in managing their everyday lives.

A summary table regarding the research gap is displayed below.

Feature	Research 01	Research 02	Research 03	Proposed System
Visual & Auditory Functionality	✓	✗	✗	✓
NLP base AI Voice	✗	✗	✗	✓
Caregiver Management Access	✗	✗	✗	✓
Real-Time Notification System	✓	✓	✗	✓
Memory Aid Integration	✗	✗	✗	✓
Routine Tracking	✗	✗	✓	✓

Figure 1 Research Gap Table

1.3 Research Problem

Due to memory problems, Alzheimer's sufferers sometimes find it difficult to maintain their regular schedules, which can result in missed appointments and prescriptions. Although there are some technologies available to assist with reminders, there isn't a comprehensive system that integrates carer assistance, routine management, and auditory and visual signals. The issue is the absence of a comprehensive solution that assists carers of Alzheimer's patients and helps them adhere to their regular routines.

02. Objectives

2.2 Main Objective

The main objective of this research is to develop and evaluate a comprehensive system that utilizes visual and auditory reminders to enhance adherence to daily routines in Alzheimer's patients, while also integrating caregiver support to improve overall patient management.

2.2 Specific Objectives

Design and Implement Visual and Auditory Reminders:

- Create visual cues such as images, icons, and colors for events like appointments, visits, and medication times.
- Develop auditory alerts that provide gentle voice reminders for these events.

Develop Routine Management Tools:

- Implement a daily schedule display that visually represents activities including wake-up, meals, medication, and bedtime.
- Create an adaptive scheduling system that adjusts based on changes in the patient's routine.

Integrate Memory Aids:

- Include contextual details for events to help patients understand who, what, and why of each activity.
- Use photos or short videos of family members or caregivers to make reminders more personalized.

Create a Simplified User Interface:

- Design a user-friendly interface with large buttons and clear text for ease of use.
- Incorporate voice control functionality to allow interaction with the system via voice commands.

Implement Caregiver Integration:

- Enable caregivers to remotely add, modify, and manage events in the system.
- Provide real-time updates to caregivers if a patient misses an event or medication.

2.2.1 User Requirements

The proposed Visual and Auditory Reminders on Adherence to Daily Routines in Alzheimer's Patients has to consider following user requirements.

Visual Cues:

- The system must display clear and recognizable images and icons representing various daily events.

Auditory Reminders:

- The system must provide gentle and understandable voice reminders for scheduled events.

Daily Schedule Display:

- The system must show a visual representation of the patient's daily routine, including key activities.

Adaptive Scheduling:

- The system must adjust the daily schedule based on real-time changes in the patient's routine.

Personalized Memory Aids:

- The system must include photos or videos of family members and caregivers to personalize reminders.

Simplified Interface:

- The interface must be easy to navigate with large buttons and clear text.

Voice Control:

- The system must support voice commands for user interaction.

Caregiver Access:

- The system must allow caregivers to remotely manage and update the patient's schedule.

Real-Time Notifications:

- The system must provide real-time notifications to caregivers if a patient misses an event or medication.

2.2.2 Functional Requirements

A Visual and Auditory Reminders on Adherence to Daily Routines in Alzheimer's Patients may include the following functional requirement:

Visual Reminder Functionality:

- The system must be able to display and update visual cues for different events.

Auditory Reminder Functionality:

- The system must be capable of generating voice alerts for scheduled reminders.

Routine Tracking and Display:

- The system must track and visually display the patient's daily schedule.

Adaptive Scheduling Algorithm:

- The system must include an algorithm to adjust the schedule based on changes in the patient's routine.

Memory Aid Integration:

- The system must integrate contextual information and multimedia elements for reminders.

User Interface Design:

- The system must provide a simplified and user-friendly interface.

Voice Command Recognition:

- The system must support and accurately recognize voice commands.

Caregiver Management Access:

- The system must allow caregivers to add, modify, and manage events remotely.

Notification System:

- The system must send real-time notifications to caregivers about missed events or medications

2.2.3 Non-Functional Requirements

The following are some instances of non-functional needs of the component:

Usability:

- The system must be easy to use, with a user-friendly interface designed for Alzheimer's patients.

Accessibility:

- The system must be accessible to users with varying degrees of cognitive impairment and physical ability.

Reliability:

- The system must operate reliably, ensuring that reminders and notifications are delivered accurately and timely.

Scalability:

- The system must be scalable to accommodate the addition of new features or integration with other systems as needed.

Security:

- The system must ensure the privacy and security of patient and caregiver data.

Performance:

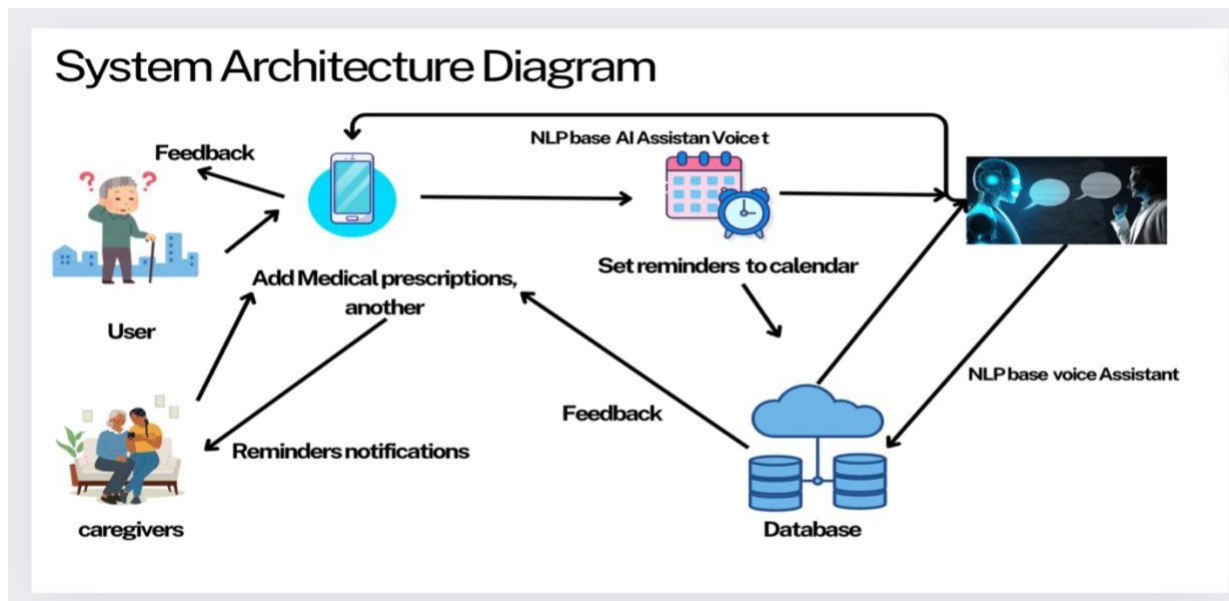
- The system must perform efficiently, with minimal latency in delivering reminders and notifications.

Maintainability:

- The system must be designed for easy maintenance and updates to address any issues or incorporate new features.

03. Methodology

3.1. Overall System Overview



The system developed for the research on "Impact of Visual and Auditory Reminders on Adherence to Daily Routines in Alzheimer's Patients" is designed to support individuals with Alzheimer's in managing their daily activities effectively. It integrates visual and auditory reminders to help patients adhere to their routines. Visual cues, such as images and icons, represent key events like appointments and medication times, making them easily recognizable. Complementing these are gentle auditory reminders that provide clear voice alerts for upcoming tasks.

The system includes a daily schedule display that visually organizes the patient's routine—covering wake-up times, meals, medication, and bedtime—while adapting to changes as needed. Memory aids are also incorporated, offering contextual details and using photos or short videos of family members to make reminders more personal and engaging.

The interface is designed to be user-friendly, with large buttons, clear text, and voice control options to accommodate cognitive impairments. Caregiver integration allows for remote management of the patient's schedule and provides real-time notifications for missed events or medications. This comprehensive system aims to improve routine adherence, enhance the quality of life for Alzheimer's patients, and support caregivers in effective patient management.

3.1.1 Hardware Component



Figure 2 3.1.1 Hardware Component

Smartphones and tablets offer access to the platform's front-end interface, allowing carers, professionals, and patients to interact with the system. They enable features like as cognitive tests, real-time speech analysis, and care recommendations.

04. Description of Personal and Facilities

4.1. Functionality of The Project Component

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Task: Visual and Auditory Reminders on Adherence to Daily Routines in Alzheimer's Patients

4.1.1. Connectivity Of the Project Component

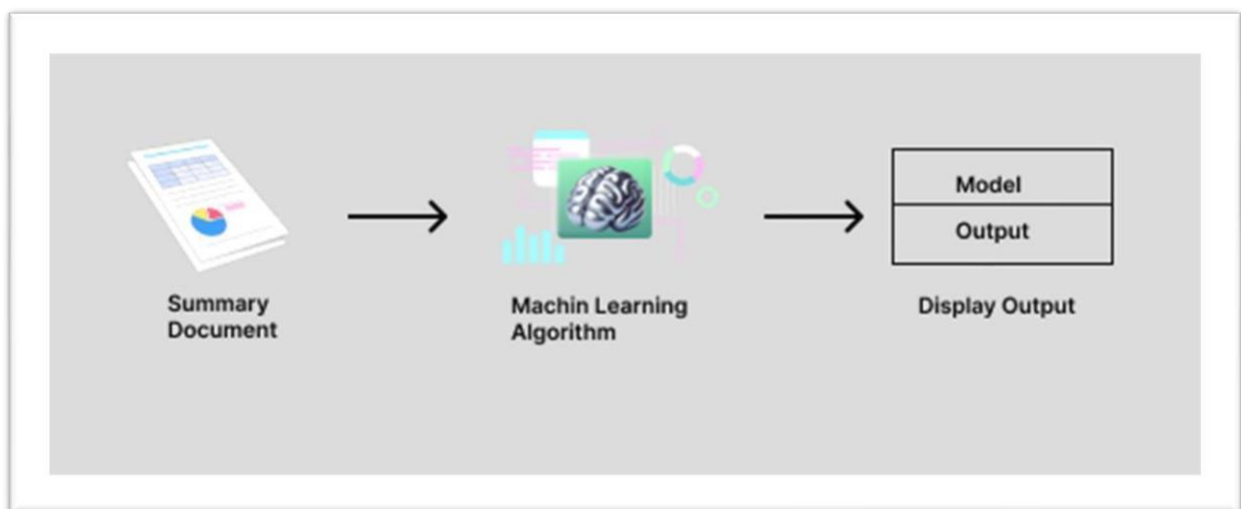


Figure 4 4.1.1. Connectivity Of the Project's Component

4.1.1. Functionality Of the Hardware Component

Smartphone and Tablet

Provide access to the platform's user interface, enabling caregivers, clinicians, and patients to interact with the system. Support real-time updates, alerts, and insights.

4.2. System Technology

Programming Languages

- Python
- React Native
- JavaScript
- HTML/CSS

Tools

1. TensorFlow - an open-source software library for dataflow and differentiable programming across a range of tasks.
2. Visual Studio Code - A lightweight and adaptable code editor that supports a variety of programming languages and frameworks. It's great for building using React Native or Flutter.
3. Android Studio - The official IDE for Android development, which also works with Flutter. It includes comprehensive tools for designing, testing, and debugging Android applications.
4. Figma - A cloud-based design tool for UI/UX design that facilitates cooperation between designers and developers. It's perfect for developing prototypes and wireframes for mobile apps.
5. Firebase - Firebase offers a full suite of mobile app development capabilities, including authentication, real-time databases, cloud storage, and hosting.
6. Firebase Test Lab - Firebase provides a cloud-based application testing environment. It allows you to test your app across a variety of devices and setups.
7. GitHub - Platforms for hosting Git repositories that include tools for continuous integration (CI), problem tracking, and collaboration.
8. Firebase Cloud Message - FCM is a cross-platform messaging solution that lets you deliver notifications and messages to users on Android, iOS, and web apps.

Hardware parts

- Smartphones and Tablets

A variety of smartphones and tablets with varied operating systems (iOS and Android), screen sizes, and hardware specifications are necessary to evaluate the app's compatibility, performance, and user experience.

Examples:

Android: Google Pixel, Samsung Galaxy, and OnePlus devices.

iOS: iPhone models (latest versions like iPhone 12, 13, or after) and iPads.

05. Gantt Chart

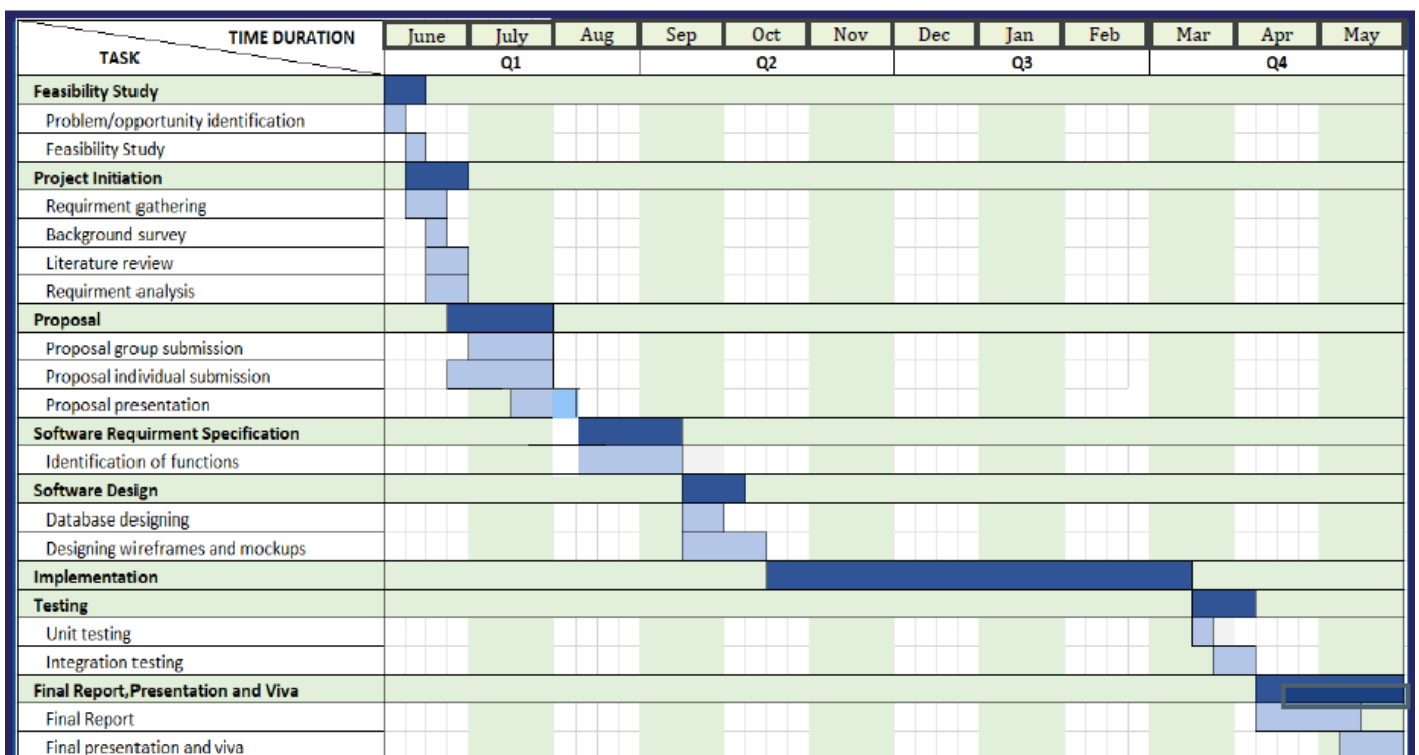


Figure 5 5 Gantt Chart

06. Work Breakdown Structure

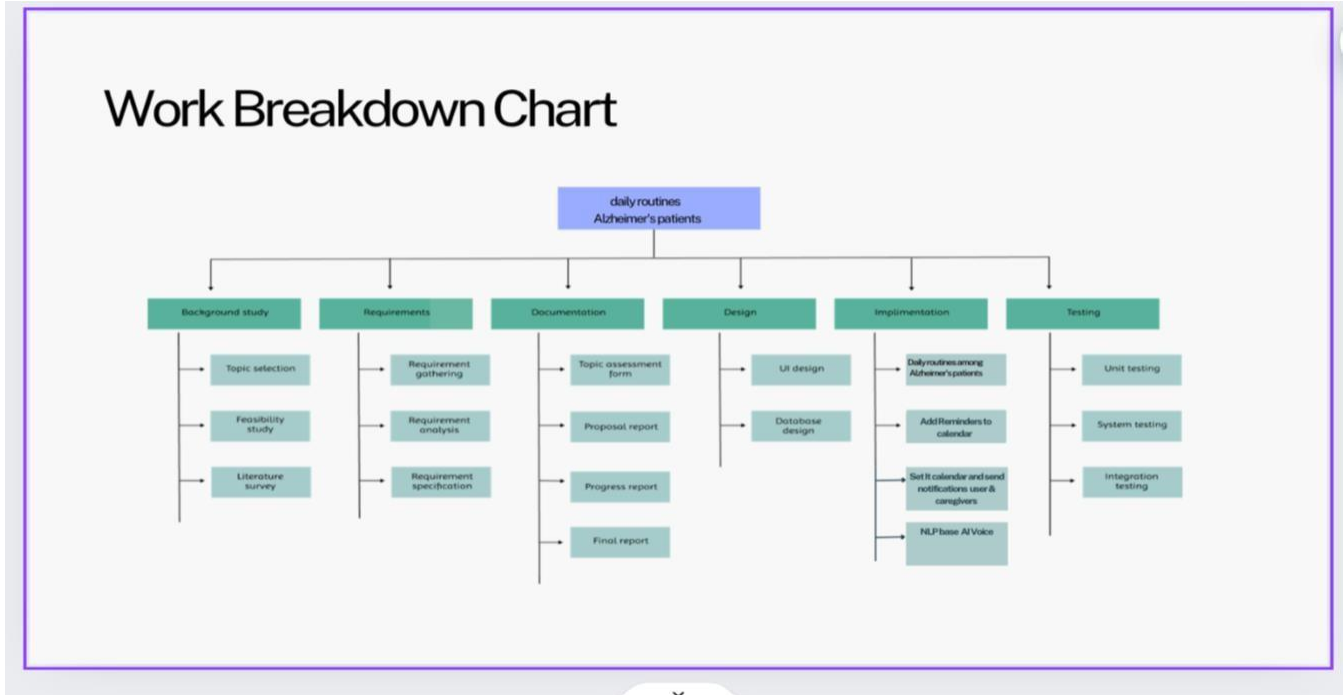


Figure 6 6. Work Breakdown Structure for work breakdown Structure

07. Commercialization

The commercialization of the system designed for enhancing adherence to daily routines in Alzheimer's patients will target key stakeholders including healthcare providers, Alzheimer's care facilities, and individual patients and caregivers. The system integrates visual and auditory reminders to support routine management and improve patient adherence to daily activities. A web and mobile application will be developed to provide users with easy access to these reminders and management tools.

Commercialization Strategies:

1. **Product Launch:** Introduce the system to healthcare providers and Alzheimer's care facilities to showcase its benefits and effectiveness in improving patient routines.
2. **Workshops and Training:** Conduct free workshops and training sessions for healthcare professionals and caregivers to demonstrate how to use the system effectively.
3. **Targeted Outreach:** Promote the system to organizations and communities involved in Alzheimer's care, emphasizing its potential to improve patient adherence and quality of life.
4. **Social Media Campaigns:** Leverage social media to raise awareness about the system and its benefits, reaching a broader audience including potential users and caregivers.
5. **Partnerships:** Collaborate with healthcare institutions, Alzheimer's organizations, and technology distributors to expand the reach and accessibility of the system.

After implementation, the system will undergo a series of tests to ensure reliability and effectiveness. A patent will be filed to protect the intellectual property, and the system will be formally launched to the public.

Target Audience

1. **Healthcare Providers:** Institutions and professionals involved in the care of Alzheimer's patients.
2. **Alzheimer's Care Facilities:** Nursing homes, assisted living, and memory care units that manage daily routines for patients.
3. **Caregivers and Families:** Individuals who provide daily care and support for Alzheimer's patients.

Market Space

1. **User-Friendly Design:** The system is designed to be accessible without requiring advanced technical knowledge, ensuring ease of use for patients and caregivers.
2. **Access Control:** Only authorized users, including caregivers and healthcare professionals, will have access to the system, ensuring privacy and security.
3. **Integration:** The system can be integrated with existing care management practices and technologies, providing a seamless addition to current routines.

Future Scope

1. **Scalability:** The system can be adapted for use in different care settings and for various levels of cognitive impairment, providing scalable solutions for a wide range of users.
2. **Expansion:** Future developments may include advanced features such as IoT integration for more personalized and adaptive care solutions, enhancing overall care for Alzheimer's patients.

08. Budget

Description of Tasks	Estimated
1. Clod Infranstructure	Rs. 8000
2. Internet Charges	Rs. 5000
3. Travelling Cost for Information Collection	Rs. 10000
4. Data gathering	Rs. 10000
Total	33000

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