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AGA

Advanced Guidance Assistance

*Written by*

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**04th November 2024 – 11th April 2025**

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Abstract

The Advanced Guidance Assistance (AGA) project is a two-part solution designed specifically to support individuals with ADHD in managing their daily tasks and routines. It consists of an intuitive web application paired with a physical companion bot device. Together, they act as a personal assistant that provides structured guidance, reminders, and encouragement to help individuals stay focused and on track throughout their day.

The web application offers features such as customisable task lists, while the companion bot provides interactive, real-time engagement to reinforce concentration during tasks. AGA helps reduce stress and anxiety, enhances time management, and supports the development of healthier habits and sustained productivity.

Its user-friendly interface and supportive approach aim to empower individuals to navigate their day more effectively and confidently.

Declaration

I hereby declare that the work described in this dissertation is, except where otherwise stated, entirely my own work and has not been submitted as an exercise for a degree at this or any other university.

Signed:

\_\_Lovely Fernandez\_\_\_\_

Lovely Joy Velasco Fernandez

04th November 2024

Table of Contents

[Introduction 7](#_Toc195849887)

[Project Background 7](#_Toc195849888)

[What is ADHD? 7](#_Toc195849889)

[Difficulties and Challenges of ADHD 7](#_Toc195849890)

[Strategies in how to manage ADHD 7](#_Toc195849891)

[AGA’s Solutions 8](#_Toc195849892)

[Project Overview 13](#_Toc195849893)

[Mission 13](#_Toc195849894)

[Name of Origin 14](#_Toc195849895)

[Mascot Design 14](#_Toc195849896)

[Product Slogan 14](#_Toc195849897)

[Colour Palette 15](#_Toc195849898)

[Unique Selling Feature 15](#_Toc195849899)

[Stakeholders 16](#_Toc195849900)

[Focus Group 16](#_Toc195849901)

[Investors 16](#_Toc195849902)

[Other 17](#_Toc195849903)

[Project Scope 17](#_Toc195849904)

[Web Application 17](#_Toc195849905)

[Bot Application 22](#_Toc195849906)

[Thesis Roadmap 24](#_Toc195849907)

[Literature Review 24](#_Toc195849908)

[Competitors and Existing Solutions 25](#_Toc195849909)

[Non-Technical Solutions 25](#_Toc195849910)

[Technical Solutions 25](#_Toc195849911)

[Issues with Existing Solutions 26](#_Toc195849912)

[AGA’s Approach to Identified Issues 26](#_Toc195849913)

[Requirements 26](#_Toc195849914)

[Functional 26](#_Toc195849915)

[Non-Functional 26](#_Toc195849916)

[Project Technologies and System Deliverables 27](#_Toc195849917)

[Programming Languages and Frameworks 27](#_Toc195849918)

[Hardware Requirements 27](#_Toc195849919)

[Deliverables 28](#_Toc195849920)

[Other Research 29](#_Toc195849921)

[Existing Final Year Project 29](#_Toc195849922)

[System Design 30](#_Toc195849923)

[Software Methodology 30](#_Toc195849924)

[Development Methodology 30](#_Toc195849925)

[Overview of System 31](#_Toc195849926)

[System Architecture 32](#_Toc195849927)

[Requirement Analysis 32](#_Toc195849928)

[Use Case Diagrams 32](#_Toc195849929)

[Class Analysis 37](#_Toc195849930)

[Class and Sequence Diagram 38](#_Toc195849931)

[Database Diagram (ERD) 39](#_Toc195849932)

[Project Design 40](#_Toc195849933)

[Project Sitemap 40](#_Toc195849934)

[Web App GUI Prototype 40](#_Toc195849935)

[AGA Bot GUI Prototype 41](#_Toc195849936)

[AGA Setup Manual 43](#_Toc195849937)

[Website Application 43](#_Toc195849938)

[AGA Companion Device 44](#_Toc195849939)

[Install AGA 44](#_Toc195849940)

[Testing and Evaluation 44](#_Toc195849941)

[Feasibility Testing 44](#_Toc195849942)

[Understanding User’s Needs: Results 44](#_Toc195849943)

[Findings 47](#_Toc195849944)

[Feature Testing 49](#_Toc195849945)

[Web App Feature Testing Form 49](#_Toc195849946)

[AGA App Feature Testing Form 49](#_Toc195849947)

[UI & UX Testing 50](#_Toc195849948)

[Results and Findings 50](#_Toc195849949)

[Interim Testing (Experimental Phase) 51](#_Toc195849950)

[Challenges and Difficulties 51](#_Toc195849951)

[Interim Test Cases 52](#_Toc195849952)

[Focus Mode Testing Plan 01 52](#_Toc195849953)

[Bot Facial Expressions Testing Plan 02 52](#_Toc195849954)

[Prototype Development: Experimental Phase 53](#_Toc195849955)

[Focus Mode 53](#_Toc195849956)

[Face Detection 53](#_Toc195849957)

[AGA’s Facial Expressions 54](#_Toc195849958)

[Expressions 55](#_Toc195849959)

[Refining the Approach 55](#_Toc195849960)

[Project Management 56](#_Toc195849961)

[Project Plan 56](#_Toc195849962)

[Milestones & Roadmap 56](#_Toc195849963)

[Reflection on Timeline and Unexpected Challenges 57](#_Toc195849964)

[Task Distribution 57](#_Toc195849965)

[Supervisor Engagement 57](#_Toc195849966)

[Meeting Availability 57](#_Toc195849967)

[Risk Management 58](#_Toc195849968)

[Technical Risks 58](#_Toc195849969)

[User Risks 58](#_Toc195849970)

[Project Management 58](#_Toc195849971)

[Legal and Regulatory Risks 59](#_Toc195849972)

[Project Plan for Next Phase 59](#_Toc195849973)

[Future Scope 59](#_Toc195849974)

[Web App 59](#_Toc195849975)

[AGA Bot 59](#_Toc195849976)

[Long-Term Scope 60](#_Toc195849977)

[Project Summary 60](#_Toc195849978)

[Bibliography 62](#_Toc195849979)

[Appendix 63](#_Toc195849980)

[Testing Forms 63](#_Toc195849981)

# Introduction

## Project Background

### What is ADHD?

ADHD, *Attention Deficit Hyperactivity Disorder,* is a neurological condition that affects one’s ability to focus, manage impulses, and regulate their energy levels. Individuals with ADHD may experience symptoms such as inattention, hyperactivity, and impulsivity which can impact their daily life, relationships, academic performance, and work.

*“ADHD is considered a chronic and debilitating disorder and is known to impact the individual in many aspects of their life including academic and professional achievements, interpersonal relationships and daily functioning.”* (*What Is ADHD?*, n.d.)

### Difficulties and Challenges of ADHD

According to the DSM-5, there are three presentations of ADHD – *predominantly inattentive, hyperactive-impulsive* and *combination* of the two types– where each type faces various challenges from lack of focus and organisation to issues with impulsivity and hyper-fixation. (‘Diagnosis of ADHD in Adults’, n.d.)

Individuals with inattentive ADHD often struggle to stay focused on tasks or activities, with difficulties in concentration leading to incomplete tasks. They may become easily distracted, frequently misplace or lose items, and face challenges with organisation. This can lead to forgetting daily responsibilities like chores, errands, paying bills, making calls, and attending appointments.

*“…adults with ADHD are more likely to experience memory problems, restlessness and lack of mental focus.”* (*Strategies for Adults Living With ADHD | Psychiatrists in California*, n.d.)

On the other hand, individuals with hyperactive-impulsive ADHD often display restless behaviours, such as fidgeting, squirming, or tapping. They may also hyper-fixate on specific topics or activities for extended periods, disrupting their daily balance and leading to neglect of other essential tasks, responsibilities, and personal needs. This intense focus can eventually result in burnout, which may impact their sense of self-worth and diminish self-esteem.

*“Adults with ADHD may experience poor self-worth, sensitivity towards criticism, and increased self-criticism possibly stemming from higher levels of criticism throughout life.”* (*ADHD - Brainwave Psychiatry and Wellness LLC*, 2024)

Lastly, individuals may also experience a combination of both types of ADHD, facing a mixture of the challenges associated with inattention and hyperactivity-impulsivity. Individuals struggling with ADHD affects their ability to have a life balance which in long-term affects their ability to manage work/academic responsibilities, develop a sense of self-confidence and self-worth, and engage in hobbies or recreational activities.

### Strategies in how to manage ADHD

In the article *"Strategies for Adults Living with ADHD"* from Advanced Psychiatry Associates, (*Strategies for Adults Living With ADHD | Psychiatrists in California*, n.d.), five core elements are highlighted to help manage ADHD challenges effectively:

**Organisation**  
Prepare a daily schedule each evening for the following day and review it each morning. This builds awareness of responsibilities and tasks, giving individuals greater control over their day. Focusing on one task at a time is key to staying on track. Effective time management is also essential: allot extra time for tasks and set reminders and timers to keep on schedule.

**Routine**  
Establishing consistent patterns of behaviour allows individuals to focus on other areas while ensuring that daily tasks are completed. Setting routines for chores, with the help of notifications and reminders, can reinforce habits. For example, setting a monthly reminder for fixed bills and budgeting can provide more control over finances and reduce last-minute stress.

**Make Big Tasks Manageable**  
Breaking large tasks into smaller, achievable steps can reduce feelings of overwhelm, making complex tasks more approachable and allowing for steady progress, one step at a time. Prioritisation is also essential: focus on one item at a time, starting with the most challenging task of the day to make the rest of the day feel lighter.

**Minimise Distractions**  
Creating a clutter-free, minimal environment helps reduce distractions, leading to improved focus and productivity.

**Respect Your Limits**  
Recognising your limits allows for realistic planning, ensuring that daily tasks are achievable. This reduces the likelihood of feeling overwhelmed and increases the satisfaction of completing tasks. Allocate time for well-being activities like quick walks or exercise, which help reduce stress and promote relaxation. Give yourself permission to pause, breathe, and recharge.

Through these findings, it was possible to clearly define the needs of individuals managing ADHD—structure, routine, manageable task planning, minimal distractions, and mindful self-care. These core elements can help individuals build self-worth and create a more balanced approach to managing ADHD. Establishing structure and setting realistic goals boosts confidence, while maintaining a routine to reduce overwhelm.

### AGA’s Solutions

This section outlines the key features AGA offers—designed specifically to provide practical, supportive solutions that help individuals manage their daily lives more effectively.

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| --- | --- | --- | --- |
| 01 | Focus Mode | | High Priority |
| **Description**  A concentration detection device that alerts users when they lose focus on a task or, if it senses signs of intense focus, recommends taking break. | | **Purpose**  This feature supports a healthy balance between task responsibilities and personal well-being. | |
| **Functionality**  The device will detect user’s eyes and other body parts to analyse one’s concentration on a task.   * Loses Focus   If the user’s vision diverts from the task at hand, with supporting signs like stillness or looking away for an extended period, the device will interpret this as a loss of focus and alert the user by turning red. *A sound alert may also be added.*   * Hyper Focus   If the user has spent an extended period on the task, the device will notify them to take a break.  The system will count from when the user starts the task. | | | |
| **Concept Sketch**    *Figure 1a. Focus Mode Base Concept*    *Figure 1b. Loss Focus Concept*    *Figure 1c. Hyper Focus Concept* | | | |

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| 02 | Task Setter | | High Priority |
| **Description**  Designed to minimise the overwhelm often caused by traditional, cluttered schedulers, AGA’s Task Setter focuses only on what truly matters for the day. It displays a streamlined list of tasks that are due today, organised by priority, helping individuals stay focused without feeling overloaded. In addition, it offers a simple preview of the next day’s tasks to support mental preparation without adding pressure.  A future enhancement will include a smart reminder system that provides a gentle overview of tasks in the morning, updates on remaining tasks in the evening, and a preview of the following day’s schedule at night—creating a structured, low-stress rhythm for daily task management. | | **Benefits**  This tool allows individuals to focus solely on the present day, removing the pressure of constant planning. By presenting only today's tasks it helps reduce decision fatigue, anxiety, and overwhelm. Individuals can simply see what needs to be done first and complete one task at a time. | |
| **Functionality**  The Task Setter receives tasks through AGA’s web application, with full CRUD (Create, Read, Update, Delete) functionality implemented. It is connected to a Firebase database, ensuring real-time data management and secure storage.  Users can add tasks by entering key details such as the task description, due date, and a priority level that indicates how important or urgent the task is. Once submitted, the task is displayed on the Task Setter interface, where it can be marked as completed. Tasks can also be edited or deleted at any time through the dedicated settings page, giving individuals full control over their daily task list in a simple and intuitive way. | | | |
| **Concept Sketch**    *Figure 2a. Task Setter Concept*  *Figure 2b. Updated Task Setter Concept* | | | |

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| 03 | Weather API | | Mid Priority |
| **Description**  AGA monitors real-time weather conditions and offers helpful, context-aware advice to individuals based on the current forecast. By integrating with OpenAI, AGA can generate personalised suggestions on how to prepare for the day. | | **Benefits**  This feature helps users prepare for their day, minimising any disruptions caused by unexpected weather changes.  It’s especially useful for individuals who may often overlook daily details, such as those with ADHD, who might forget to check or be aware of the weather forecast. | |
| **Functionality**  AGA retrieves real-time weather data using a weather API and then leverages OpenAI integration to generate personalised, context-aware suggestions based on the forecast. These smart prompts are delivered through the web app, helping individuals prepare for the day with less mental effort and more confidence. | | | |
| **Concept Sketch**    *Figure 3a. Weather API Concept* | | | |

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| 04 | Mood Log | | Mid Priority |
| **Description**  The mood tracker records the user’s overall mood each day and provides insights for the past 4 weeks. | | **Benefits**  This offers a valuable overview of the user’s mental well-being, supporting self-reflection and a deeper understanding of personal emotional patterns | |
| **Functionality**  Individuals can log their mood throughout the day using the Mood Tracker. These entries are saved in the database, and at the end of each day, the most frequently logged mood (the mode) is determined and used for visualisation.  This data is then plotted on a graph that displays mood trends across Monday to Sunday, with four distinct lines representing each week of the month. This allows individuals to easily track emotional patterns over time and identify how their mood may be influenced by routines, tasks, or external factors.  *\*Note: The graph is limited to a four-week view to reduce unnecessary focus on distant past data and keep attention centred on what’s most relevant—recent activity and current emotional trends.* | | | |
| **Concept Sketch**    *Figure 4. Mood Log Concept* | | | |

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| 05 | Daily Affirmations | | Low Priority |
| **Description**  The Daily Affirmation feature is designed to offer emotionally relevant and supportive messages that help individuals start their day with positivity and encouragement. | | **Benefits**  This feature supports mental well-being, a core area where individuals with ADHD often face challenges. The affirmation serves as a reminder of their value and something positive to look forward to each day. | |
| **Functionality**  This feature is integrated with the Mood Tracker. It analyses the most logged emotion (the mode) and categorises it as a high, mid, or low emotion. Based on this classification, the system selects a suitable affirmation from a curated JSON file of prewritten messages that relates to the user’s emotional range.  This process happens automatically and presents the affirmation at the appropriate time to provide a meaningful start to the day. | | | |
| **Concept Sketch**    *Figure 5. Daily Affirmations Concept* | | | |

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| 06 | Well-Being Tools | Low Priority |
| **Description**  This tool offers a range of features focused on well-being, including mindfulness activities like breathing exercises and reflection time, an activity recommender, and a balance system that tracks work and activity hours.  **Mindfulness Activities**  These are scheduled notifications prompting the user to engage in activities like breathing exercises or reflection time. AGA guides the user through each step, for example, instructing them to "breathe in and breathe out" during breathing exercises and providing positive reinforcement along the way.  **Activity Recommender**  This feature introduces users to new learning or recreational activities, which stimulate the mind and improve mental health.  **Balance System**  This system tracks the user’s overall work and activity hours, alerting them to any imbalance between work and relaxation. By bringing awareness to any disparities, it helps users understand areas needing improvement, potentially uncovering sources of stress. | | |

*\*\*Note: Wellbeing-tools feature was planned as an additional enhancement to be implemented if the project was completed earlier than expected.*

## Project Overview

### Mission

The Advanced Guidance Assistant, *AGA*, is designed to support individuals with ADHD in managing daily tasks and maintaining a structured, balanced lifestyle. ADHD often brings unique challenges, such as difficulties with *organisation, time management, and task prioritisation*, which can make daily routines feel overwhelming. AGA aims to provide tailored guidance and assistance to help users tackle these challenges through a structured, user-friendly approach.

AGA is delivered through two interconnected components: a web application and a physical companion device. By integrating supportive tools and strategies, AGA empowers users to take control of their routines, reduce stress, and enhance their quality of life.

### Name of Origin

The name “AGA” is derived from the word Agape, meaning “unconditional love” in Latin. This reflects my passion for contributing to the improvement of mental health and well-being. The choice of this term symbolises the unconditional care and dedication behind the project’s development.

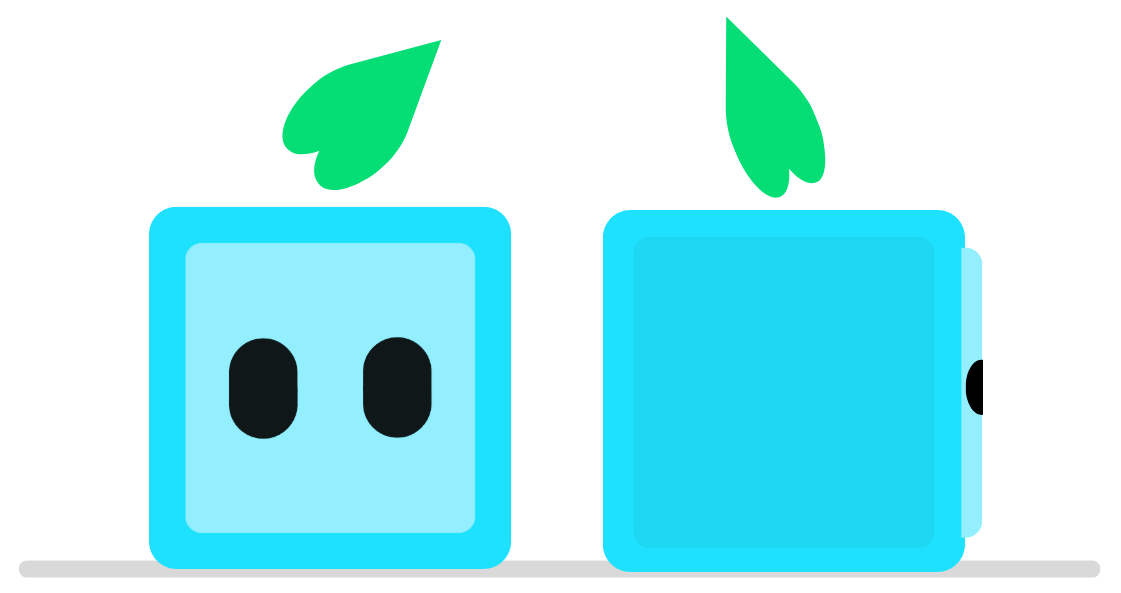
Additionally, in Korean, “AGA” (“아가”) translates to “baby,” which adds a gentle and approachable touch - framing AGA as a kind of supportive companion. With these layered meanings, the name was chosen to represent the product.

To help people more easily understand what AGA represents, the abbreviation Advanced Guidance Assistance was later developed to give the name a clear, functional identity that reflects its core purpose.

### Mascot Design

AGA is designed as a cubic bot with a leaf on top, embodying the values of balance, growth, and resilience. The cube shape, with its six equal square faces, symbolises unity and balance, while the stable square base represents a strong foundation - *a solid core*.

This idea was inspired by Peter Cromwell’s book, “Polyhedra”, which explores the symbolic significance of the cube as a representation of stability. As Cromwell stated in page 55, “The cube stands upright on a square base, expressing stability.” (Cromwell, 1997)

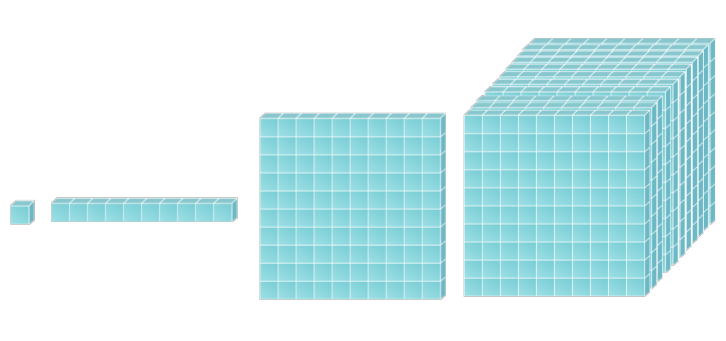
  
*Figure 7. AGA Mascot*

The design reflects AGA's mission to help users find stability and balance in their lives, strengthening their sense of self. The leaf on top signifies growth and the journey of self-discovery and improvement that users embark upon with AGA.

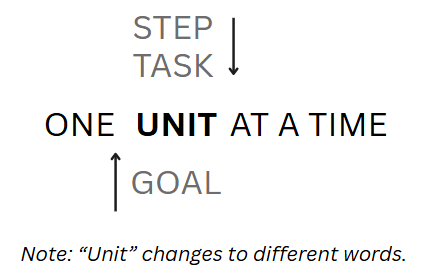
### Product Slogan

The cube design also holds personal significance, as it draws inspiration from primary school maths classes where unit cubes were used to visualise mathematical logic. AGA is represented as a single unit - symbolising a starting step. Just as individual units build into tens, hundreds, and thousands to eventually form larger cubes, they metaphorically represent progressive growth.

Each unit marks the beginning of a journey: one step, then ten, then a hundred, and so on achieving in something greater. This visual metaphor illustrates that every accomplishment is both a meaningful milestone and a stepping stone toward a larger, ongoing journey.

  
*Figure 8. The Cycle of a Unit*

This concept of units as foundational steps toward a goal directly inspired the slogan “One Unit at a Time.” Each unit symbolises a single step, task, or achievement in an individual's journey, reinforcing the idea that meaningful progress is made gradually—one unit at a time.

  
*Figure 9. AGA’s Slogan*

### Colour Palette

A green and blue gradient

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*Figure 10. Colour Palette Gradient*

The chosen colour palette features a gradient between blue and green, carefully selected to reflect the essence of AGA. Blue symbolises calmness and stability, aligning with AGA’s goal of providing emotional support and structure. Green represents personal growth and progress, capturing the journey of self-improvement and development that individuals experience while using the tool.

Together, the gradient visually communicates the transition from calm to growth - mirroring AGA’s mission to support individuals with ADHD as they move from overwhelm toward balance and empowerment.

### Unique Selling Feature

The key selling feature of AGA is its minimalist approach. AGA is intentionally designed to help individuals focus only on today - and a preview of tomorrow - highlighting what truly matters without overwhelming them with long-term planning. By prioritising tasks for the current day and offering a simple preview of the next to mentally prepare, AGA encourages users to complete one task at a time with clarity and purpose.

It also includes helpful supporting tools such as calendar and weather integration, enhanced by OpenAI-powered suggestions that advise individuals on how to prepare for the day based on weather conditions. Insights from mood logs over the past four weeks allow users to identify emotional patterns, while daily affirmations help reinforce self-worth and positivity.

Finally, the Focus Mode feature ensures that individuals remain dedicated to the task at hand - offering either gentle guidance to stay on track or a reminder to take a break when signs of overworking occur.

At its core, AGA’s main value lies in its commitment to helping individuals complete one task at a time. With its various tools offered - mood tracking, weather insights, date awareness, and motivational affirmations - it empowers individuals to stay present, focused, and balanced throughout their day.

## Stakeholders

### Focus Group

**Primary Users**AGA’s tools are thoughtfully designed to support individuals with all three types of ADHD: inattentive, hyperactive-impulsive, and combined. These individuals often face challenges with focus, organisation, and task management. AGA offers solutions that help users find balance between their responsibilities and personal interests.

Key features include a Task Setter that focuses attention on today’s priorities while providing a preview of tomorrow, a Focus Mode that supports concentration and promotes well-being, and additional tools such as a calendar, a weather integration with AI-generated suggestions, and a mood tracker that offers daily affirmations. Together, these features create a structured, supportive environment to help individuals with ADHD navigate daily life more confidently.

**Secondary Users**The secondary target market are students who are trying to balance academic responsibilities with personal life. Focus Mode can assist students in maintaining concentration to complete their tasks, while also encouraging time for self-care and personal activities. With the Task Setter, students can set reminders for assignments, exams, and other deadlines. The priority feature enables AGA to order the tasks, therefore, allowing the user to focus on one priority at a time.

Although developed with individuals with ADHD in mind, AGA is designed to be accessible to anyone experiencing difficulties with maintaining routines, staying focused, or simply seeking more structure in their daily life.

### Investors

As mental health—especially ADHD—continues to gain global recognition, there has been a significant increase in investment toward innovative digital health solutions. Recent initiatives, such as the UKRI Mindset XR Innovator Support Programme (Farnley, 2024) and Innovate UK’s £3.2 million investment in immersive mental health projects (*Innovate UK Invests £3.2m to Improve Mental Health Services*, 2024), highlight the drive to develop accessible, mental health technology-based tools. By using tools like XR (Extended Reality), these programs are helping tackle everything from ADHD to depression, making well-being tools more available and affordable.

Importantly, targeted investments in ADHD-focused solutions, like Inflow's €2 million funding for an ADHD self-management app (*UK Founded Inflow Boosted by €2M Raise for ADHD App*, 2022), showcase the rising demand for digital tools that help individuals manage ADHD symptoms through evidence-based techniques.

With the growing focus on ADHD and mental well-being support, AGA aligns perfectly with these investment interests and contributes to the movement of enhancing quality of life through better mental health support.

### Other

The stakeholders for AGA include both internal and external groups. Internally, they consist of myself as the developer, my supervisor Bojan Bozic, and TUD staff who will be examining this project.

Externally, stakeholders include primary and secondary users—individuals with ADHD and students, respectively. While these groups are the main focus, AGA is designed to be accessible and beneficial to anyone seeking structure, focus, and routine in their daily life.

Investors in the healthcare tech industry who are interested in supporting innovative mental health solutions, such as, mental healthcare professionals and advocates, who are essential for validating the tools and potentially recommending it to patients.

Lastly, educational institutions that could adopt AGA as a support tool for students, and government bodies focused on mental health initiatives and accessible solutions are key stakeholders in this project.

## Project Scope

AGA’s feature components are delivered through a physical cube device and a web application. The physical cube provides direct interaction for features like Focus Mode, while the web application allows users to set up and manage Task Setters for the cube such as task details and assigning priorities.

The project scope of AGA includes the following components:

### Web Application

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| 00 | Website | High |
| **Scope**  Involves the design and development of a responsive website for AGA that will serve as the platform for delivering its web-based features. The website will be accessible across a range of devices, including laptops, mobile phones, and tablets.  **Web-App Pages**   1. **Home (*Landing Page*)**     * Login & Sign Up (Button)    * Text Space (Message)    * Slogan      + “Unit” wheel animation    * About Us (Button) 2. **Main Page**     * Task Setter    * Weather + AI Suggestion    * Calendar    * Mood Log + Daily Affirmation    * Focus Mode (Future Scope – Hold Placement) 3. **About Us**     * Text Space (About)    * Images    * Creator Message 4. **Help Form (*Contact Us*)**     * Two advertisement spaces    * Contact form (Connect to email to receive forms)    * About Tools      + Image/Icon + Description 5. **Settings**     * Change Photo    * Setting Form      + Name      + Password      + Block Email      + Block DOB      + Save Changes (*Prompt password to reconfirm action)*    * Deactivate    * Task Setter Backlog (*Placed here to reduce clutter in Main)*      + Task information        1. Description        2. Date        3. Priority      + Edit and Delete option      + Place old tasks on top of task setter, greyed out and with a message “*Reschedule?”* 6. **Login and Sign Up**     * Login Form      + “New Account? Click here!” to route to Register Form      + Credentials require: Email, Password      + Reset Password Button    * Register Form      + “Already have an account? Click here!” to route to Login Form      + Credentials require: Name, Email, Password, DOB      + Age Restriction    * AGA gif animation 7. **Apply to All**     * Logo + Name (Route to Home/Landing)    * Footer: Media Links, Navigation Bar, Logo and Creator Stamp    * Navigation Bar: Home, About, Account Buttons or User Profile    * Language Option   **Technology Stack:** Next.js, TypeScript, Tailwind CSS, React, Firebase…  *Note: Icons and symbols were purposely used throughout the interface where they could convey meaning more effectively than text. This approach was chosen to enhance universal accessibility and ensure that the application remains intuitive and easy to understand for a wide range of user.* | | |

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| --- | --- | --- |
| 01 | Account | High |
| **Scope**  Implement a secure, minimal, and user-friendly account system that allows users to create, manage, and optionally delete their accounts.  *The system must comply with age restrictions and data privacy regulations such as GDPR.*  **Core Features**   1. **Account Creation (Sign Up)**     * Retrieve user registration information:      1. Name      2. Email      3. Password      4. Date of Birth    * Age verification (*Must be above 13 years of age.)*    * Successful sign up:      1. Create a Firebase Auth User      2. Store user data in Firestore 2. **Login**     * Users can log in with email and password    * Handle errors      1. Wrong credentials      2. User not found 3. **Password Reset**     * “*Forgot Password”* option    * Allow users to enter email and receive a password reset link 4. **Settings Page**     * Display current user information    * Allow users to:      1. Edit name      2. Change password      3. Upload/change profile picture      4. Save changes 5. **Account Deactivation/Deletion**     * Option to deactivate the account    * Ask for password confirmation before proceeding   **Compliance & Restrictions**   * Minimum age: 13 years (*Check DOB during signup)* * Data Minimisation (GDPR)   + Only collect name, email, password, date of birth * Secure password storage (*Encrypted by Firebase Auth*)   **Technology Stack**   * **Frontend**: Next.js, TypeScript, Tailwind CSS * **Auth & Backend**: Firebase Authentication * **Database**: Firebase Firestore   **Future Improvements**   * Social Login (*Google, etc.*) * Include a “*Terms and Condition”* | | |

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| 02 | Task Setter | High |
| **Scope**  A simple task manager (Main) that helps users stay on top of their priorities and reducing overwhelm by only showing todays and tomorrow’s tasks. User can add, edit, complete, and delete tasks, with a separate backlog view for all tasks in Settings.  **Core Features**   1. **Main Page**     * Add task: Description, date, priority (Connect to DB)    * Complete task (Checkbox Tool)    * Display only today’s and tomorrow’s tasks      1. Scrollable to reduce number of tasks displayed      2. Order by priority weight (Colour coded) 2. **Settings Page**     * View full task backlog    * Edit or delete tasks    * Display order by date    * Overdue tasks appear at the top, greyed out with *“Reschedule?”*   **Restriction**   * Limit display task view to today and tomorrow to reduce overwhelm * Reinforces AGA’s message: “*One unit at a time.”*   **Technology Stack**   * **Frontend**: Next.js, TypeScript, Tailwind CSS * **Database**: Firebase Firestore | | |

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| 03 | Weather Tool | Mid |
| **Scope**  A weather assistant that shows current weather and temperature based on the user’s location, with AI-generated suggestions on how to prepare for the day.  **Core Features**   1. **Weather Display**     * Retrieve current weather and temperature using OpenWeather API    * Display weather icon and temperature that corresponds to weather data 2. **AI Suggestions**     * Use OpenAI API to generate advice to prepare against weather (e.g., "Bring an umbrella today!" or "It’s a good day for light clothing.") 3. **Location Handling**     * Ask user permission to access current location    * Use location coordinates to fetch weather data    * If permission is denied, provide an error message that is unable to retrieve weather and to enable location.   **Restriction**   * Must ask for location permission to retrieve weather (GDPR compliance)   **Technology Stack**   * **APIs:**   + OpenWeather API – real-time weather and temperature   + OpenAI API – smart suggestions | | |

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| 04 | Mood Tracker | Mid |
| **Scope**  A self-reflection tool that allows users to log their moods throughout the day, view patterns over time, and receive personalised affirmations based on their emotional state.  **Core Features**   1. **Mood Log**     * User selects one of five moods: *(Angry, Sad, Okay, Happy, Excited)*    * Determine main mood using mode of most frequent mood logged that day: *Users can log multiple times per day* 2. **Mood Insights Chart**     * Display mood trends over the past four weeks    * Data visualised using a line graph 3. **Daily Affirmations**     * Display affirmation message based on frequent mood    * Pull message from JSON file:      1. High – For Happy or above mood      2. Mid – Okay Mood      3. Low – Sad or below mood   **Requirements**   * Calculate mode of daily mood logs * Plot mood trend over time * Use a JSON file to store categorised affirmations   **Technology Stack**   * **Charting**: Recharts (Visualise 4-week mood trends) * **Affirmations**: JSON file categorised by mood level | | |

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| 05 | Calendar Tool | Low |
| **Scope**  Minimal calendar widget that displays yesterday, today, and tomorrow with their respective dates and day. Its purpose is to help users stay aware of where they are in the week.  **Core Features**   1. **Display *(Day, DD MM YY)***     * Yesterday’s date and day    * Today’s date and day    * Tomorrow’s date and day 2. **Simple and clean UI**     * Larger font on Today’s date | | |

### Bot Application

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| 00 | Bot Base | High |
| **Scope**  A physical, screen-based companionbot designed to help users maintain healthy work habits and improve focus level. Through animated facial expressions, time tracking, break reminders, facial detection, and passive interaction, it becomes an interactive and emotionally engaging productivity assistant.  **Bot Components**   1. **Home**     * Clock    * Calendar 2. **Main Page**     * Focus Mode    * Home    * Data Insights 3. **Idle Animation**     * AGA animation/facial expressions 4. **Interaction**     * Single Tap: Navigate through tools    * Double Tap: Interact with AGA (Bonus Animation)      + *Fun and emotional feedback interaction. Builds trust, and emotional connection with the user.*   **Technology Stack**   1. **Hardware**    * **Raspberry Pi 4 Model B** – Acts as a small computer to run Python programs. Using a Rasp Pi came with a learning curve.   *The goal was to make the bot as compact as possible, within my desired size constraints. Although it's still slightly larger than intended, it is as close as it could get within the available resources.*   * + **Camera (HBVCAM-3M2111 V22) –** Face detection   + **Screen (Touch)–** AGA’s Face Interaction  1. **UI & Animation:** Kivy + Custom Expression Assets 2. **Face Detection:** OpenCV and DLib 3. **Language:** Python   **Purpose**   * Encourage consistent focus and healthy break cycles * Improve awareness of time * Visualise progress and acknowledge effort * Build emotional connection with AGA via animated expressions – creates a sense of companionship. * Offer fun, human-like interactions to build user engagement and trust.   *Note: Icons and symbols were purposely used throughout the interface where they could convey meaning more effectively than text. This approach was chosen to enhance universal accessibility and ensure that the application remains intuitive and easy to understand for a wide range of user.* | | |

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| 01 | Focus Mode | High |
| **Scope**  Help users maintain healthy work habits and improve focus by enforcing regular break times to prevent overwork and reduce stress.  **Bot Components**   1. **Face Detection**     * Use OpenCV and DLib to check if user is within detection area and focused on task.    * Undetected:      1. After 30 seconds, a warning animation prompts.      2. If warning animation persists after 5 minutes with no user feedback/return to detection. System will exit focus mode and return Home. 2. **Break Reminders**     * Track user’s work hour progress    * Send break reminders every milestone marker (30/60/90):      1. 30 Minutes – 5-minute break (Suggestion)      2. 60 Minutes – 10-minute break (Suggestion)      3. 90 Minutes – 15-minute break (Forced)    * After break, system prompts user to return to the task. If no action (5Mins), return home. 3. **Display**    * Base display is AGA’s idle animation    * Every 10 seconds, session timer and time is show on screen.   **Purpose**   * A 15-minute break is enforced after every 90 minutes of continuous work to support the user's well-being and maintain a healthy work-life balance. * Once the break timer ends, a reward system is triggered to acknowledge and celebrate the user's progress. This allows users to be aware of their effort and hard work. | | |

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| 02 | Data Insights | Low |
| **Scope**  The system displays yesterday’s total work hours to remind users of the hard work they've put in, and today’s current progress to help them stay focused and motivated throughout their day. Data from other days is automatically deleted, as they are considered no longer relevant - reinforcing a forward-focused mindset.  *This design reflects AGA's core principle: learn from yesterday, focus on today, and prepare for tomorrow, encouraging users to acknowledge their effort, stay present, and keep moving forward.*  **Core Features**   1. **Display**    * Yesterday’s total work hours    * Today’s work progress    * Return to Idle Animation after 30 seconds of inactivity | | |

## Thesis Roadmap

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| --- | --- |
| **Introduction and Project Background**  In-depth study of ADHD, defining the condition, identifying key challenges, and exploring how AGA can serve as a potential solution.  **Literature Review and Existing Solutions**  A review of existing solutions and competitors, to analyse their strengths and limitations, as well as, comparing them to AGA’s unique offerings.  **Project Planning and Feasibility Analysis**  Establishes the project management framework and assesses the feasibility and potential success of AGA, considering its impact and usefulness.  **Design and Prototyping**  Focuses on selecting the colour palette, UI design, and overall aesthetics of AGA to create a clear vision for the final product and web application.  **System Architecture and Code Implementation**  Guide the coding process and ensure structured implementation through use cases, requirements analysis, and system modelling. | **System Architecture and Code Implementation**  Guide the coding process and ensure structured implementation through use cases, requirements analysis, and system modelling.  **Testing and Evaluation**  Define testing formats to thoroughly evaluate AGA’s functionality and effectiveness.  **Refinement and Final Review**  Refine the code and functionality, enhancing AGA’s performance and user experience (UX).  **Documentation and Project Launch Preparation**  Finalise all project documentation, including final reports, the user manual, and any additional necessary deliverables.  **Project Submission**  Project overview report and presentation for submission with all required components. |

Refer to *Project Management section (Milestones and Roadmap)* to review the specific objectives outlined for the project. This section details key milestones which define the project's goals and intended outcomes.

# Literature Review

This section explores existing solutions from competitors, highlighting the similarities and differences that set AGA apart. It also examines the technologies essential for delivering the project, including tools, frameworks, and platforms best suited to its specific needs.

In addition, a functional and non-functional review of AGA’s system requirements to establish a foundation for creating key design elements such as use cases, class analysis, sequence diagrams, class diagrams, and database diagrams which serve as the building blocks for the project's development.

## Competitors and Existing Solutions

Understanding the market competition is essential for defining the value and uniqueness of the project. This section is an analysis of current competitors and existing solutions, evaluating their features, strengths, and limitations.

By identifying what these solutions do well and where they fall short, it highlights how the project can stand out and meet unmet needs, uncovering opportunities for AGA to evolve.

### Non-Technical Solutions

Individuals with ADHD often face challenges in managing focus, organisation, and distractions, which can impact their productivity and daily functioning. Non-technical solutions, such as behavioural therapy and practical strategies as outlined in the Introduction (*Section 1, 1.1: What is ADHD?*), are commonly recommended to help individuals manage ADHD effectively. These strategies, include developing organisational systems, minimising distractions, and setting realistic limits to avoid overwhelm.

These solutions have been thoughtfully integrated into AGA’s design, offering tools that support key principles: organisation, minimising distractions, and applying realistic limitations. Focus Mode - *helps users maintain concentration* - and a Task Setter - *supports structured planning with prioritisation*. These core components, along with other smaller features, aim to provide individuals with a platform to reinforce ADHD management strategies. By integrating these tools, AGA aims to encourage individuals to maintain a healthy balanced lifestyle.

### Technical Solutions

#### goblin.tools

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*“goblin.tools is a collection of small, simple, single-task tools, mostly designed to help neurodivergent people with tasks they find overwhelming or difficult.”* (*About - GoblinTools*, n.d.)

One of the most useful tools in goblin.tools is *Magic Todo* and *Estimator*, a task management system where userscan input tasks and allow the tool to generate step-by-step breakdowns, adjusting the level of detail using a scale as well as, edit, reorder, and estimate the time required for each task, promoting better planning.

The platform uses a web-based architecture while offering mobile applications for iOS and Android, providing accessibility and ease of use across devices.

Although goblin.tools offers valuable features, its weaknesses include inconsistent time estimations, often providing different range suggestions when repeatedly submitting the same task, and vague or overly complex task breakdowns when inputs are unclear.

goblin.tools provides a strong foundation for assisting neurodivergent individuals with task management. Similarly, AGA aims to support users in managing tasks effectively but takes a different approach by focusing solely on today’s and tomorrow’s tasks. This helps to reduce overwhelm and incorporates automatic prioritisation, which in turn eases mental effort. AGA emphasises the simplicity of adding tasks, then automatically organises them based on assigned priority weights. This approach is designed to make task management more intuitive, streamlined, and user-friendly.

#### Orotmi

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*“An Ortomi is an incredibly simple creature, designed specifically to provide companionship, comfort & emotional support – just like a real pets do!”* (*Ortomi - The Adorable Robot Companion*, 2024)

Ortomi is a companion robot build to recreate the emotional connection typically found with real pets, designed to improve mental wellness and alleviate feelings of loneliness, particularly during challenging times such as the COVID-19 pandemic. While Ortomi emphasises emotional support and alleviating loneliness, AGA aims to be a practical companion for individuals, especially people dealing with ADHD, to help them organise their tasks and manage their lives more effectively.

Inspired by Ortomi’s design, AGA aims to achieve Orotomi’s friendly and engaging interactions by incorporating expressive facial features with intent to enhance user engagement and foster a supportive relationship, making AGA not just a productivity tool but also a relatable companion for motivation and support.

### Issues with Existing Solutions

A common issue became apparent during the competitor analysis, most apps marketed for supporting individuals with ADHD primarily focus on task scheduling. While task organisation is a significant challenge for people with ADHD, these apps often overlook other critical struggles, such as maintaining the scheduler or the ability to prioritise tasks. This trend is evident in many app suggestions, for example, *HelloKlarity* suggested 12 apps for ADHD where at least 5 apps were schedulers for time management. (*Top 12 ADHD Apps In 2024*, 2024)

### AGA’s Approach to Identified Issues

AGA aims to address this problem by offering more than just task scheduling features but also its Focus Mode tool, designed to help users stay concentrated on tasks such as assignments or work. In addition, the ability to assign priority weights to tasks allows users to clearly identify and focus on what needs to be done first. AGA ensures that users are better equipped to manage their responsibilities effectively and build good habits for productivity.

## Requirements

### Functional

|  |  |
| --- | --- |
| **Feature** | **Description** |
| Focus Mode | Detects user's focus and alerts for loss of concentration or hyper-focus, encouraging breaks. |
| Task Setter | Simple Task Scheduler with the focus on today and tomorrow’s responsibilities. |
| Weather API | Retrieves weather data and offers actionable suggestions based on current conditions. |
| Mood Log | Logs daily moods and provides insights on the past four weeks of logs. |
| Daily Affirmations | Displays a daily affirmation message dependent on mood log. |

*More information at Project Scope.*

### Non-Functional

|  |  |
| --- | --- |
| **Feature** | **Description** |
| Camera Security and Usability Restrictions | |  | | --- | |  |   Limits camera functionality to protect user safety and privacy. Only active if focus mode is in-use. |
| Adherence to Legal Principles | Ensures compliance with data protection and privacy laws such as GDPR. User account data is encrypted via Firebase Auth and permission prompted to access user’s location for weather API. |
| Data Minimisation | Collects only the minimum necessary data for functionalities. Minimal on Login details, collected only necessary data. |
| Purpose Limitation | Uses data solely for its stated purpose with transparency to users. |
| Consent Management | Requires explicit user consent before data collection or sharing. |
| Data Retention Policy | Retains data only as long as necessary for its intended purpose. Retains mood data for just the past 4 weeks. |
| Data Integrity | Maintains data accuracy, completeness, and reliability. |
| Right to Erasure | Allows users to request deactivation or deletion of their data. Ensure ease to deactivating/deleting account. |
| Regulation and Law | Users should meet the standard age to access the website. Age restriction applied upon account creation. |

## Project Technologies and System Deliverables

### Programming Languages and Frameworks

The project incorporates a range of programming languages and frameworks to ensure efficient development and compatibility across all different devices.

A group of logos with different colors

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*Figure 11: Tech Stack Overview*

* **Frontend & Styling**: HTML, CSS, JavaScript, TypeScript, React, Tailwind CSS, Iconify
* **Backend & Cloud**: Firebase
* **Programming**: Python
* **Frameworks & Platforms**: Raspberry Pi, Kivy
* **Face Detection & Computer Vision:** OpenCV, DLib
* **Design Tools**: Canva, Miro
* **APIs & External Services**: OpenWeatherMap, OpenAI

### Hardware Requirements

AGA, the physical component of this project will utilise a Raspberry Pi as its central hardware component, with the following elements:

* **Camera**: To enable face detection for Focus Mode.
* **Display**: A screen to present well-being messages, and for facial expressions of the robot for interactive engagement with user.
* **Screen:** Touch, to navigate features and interact with AGA.

*\*If the Raspberry Pi setup is not feasible, the project can be adapted into a mobile application, leveraging the phone’s built-in hardware - camera, microphone, and speaker.*

Using a Raspberry Pi significantly simplified the development process for this project. Instead of building a physical bot entirely from scratch, the Pi served as a compact, fully functional computer. It provided a stable platform to run the program, making it much easier to focus on building and refining the software experience, rather than spending time trying to understand complex hardware systems—especially since hardware development was not the focus of this project.

### Deliverables

The deliverables for this project include two distinct components*: a web application* and *a robot product*, each designed to offer and support specific features of AGA.

|  |  |
| --- | --- |
| **Web-App**   * Task Setter * Weather Assistant * Calendar Widget * Mood Tracker & Affirmations * *Focus Mode (Lite)\*\** | **Bot Device**   * Animated Expressions/Face * Calendar and Clock * Focus Mode * Break Reminders * Data Insights * Bonus Interaction * *Wellbeing Tools, Weather Assistance and Task Reminders\*\** |

***\*\*Future Implementation***

The web application was chosen to ensure accessibility across multiple devices, allowing users to easily manage tasks and mood logs. In contrast, AGA - the physical companion device - was specifically designed to reduce reliance on mobile phones by offering a simplified, distraction-free interface. This is particularly beneficial during study or work sessions, where staying focused is crucial. By discouraging phone usage during these periods, AGA helps users remain on task and minimise distractions.

What sets AGA apart is its integration of a physical companion device - a unique approach that supports digital wellbeing by helping users disconnect from their phones. Unlike many existing applications that sit just a swipe away from social media and endless notifications, AGA creates a clear boundary between productivity and digital noise.

*“Digital distraction refers to the interference caused by digital devices in our lives, leading to decreased productivity, negative impacts on our mental and emotional health, and even physical consequences.”* (*Digital Distraction and Its Impact on Your Health*, n.d.)

The decision to deliver AGA as both a web application and a physical device was intentional, supporting accessibility across laptops, tablets, desktops, and phones. This multi-device flexibility not only enhances usability but also reduces dependency on mobile phones, minimising the distractions typically associated with mobile apps. AGA’s straightforward, user-centred design ensures individuals can engage with their goals without unnecessary interruption.

## Other Research

### Existing Final Year Project

As part of the research for this project, I explored previous fourth-year projects from earlier years to gain insights and identify similarities to my own concept.

#### Deep

“This project is focused on designing and developing a web application that serves as a tool for enhancing productivity and effective time management. In today’s digital world, the issue of distractions and lack of focus has become increasingly widespread, creating challenges for individuals attempting to maintain productivity and accomplish their goals.

To address this concern, the project aims to offer a practical and user-friendly solution that promotes focus and minimizes distractions. The web application enables users to effectively organize and manage tasks, while also providing visibility into deadlines. Additionally, it offers insights into the time spent on work, helping users optimize their productivity.” (*Deep, James Carswell (2023)*)

|  |  |
| --- | --- |
| **Author** | James Carswell C19749651 |
| **Description**  This web application is designed to create a distraction-free environment, helping users, particularly university students, focus on long, meaningful work sessions. It acts as an immersive productivity tool for organising tasks and managing work sessions effectively. | |
| **Complexity of the Project**  The complexity of this project arises from multiple factors, including understanding and addressing user behaviour to promote focus, processing real-time data for task tracking, and providing personalised analytics through intuitive visualisations. Additionally, Deep adapts to continuous feedback while maintaining user engagement which adds another layer of complexity. | |
| **Technical Architecture**  The technical architecture of this project includes a front-end built with TypeScript, React.js, Vite, and SASS, creating a responsive user interface. The back end is developed using Go (Gin framework) with GORM for database handling, while the PostgreSQL database manages data storage. The architecture also supports both SQL and JSON querying, allowing for flexibility in handling and processing user data. | |
| **Strengths**   * Real-time Productivity Tools The ability to track tasks and visualise progress in real time boosts focus and productivity. * User Engagement The personalised analytics and study tools cater well to university students, helping them maintain attention and build efficient work habits.   **Weaknesses**   * Complexity in User Behaviour Tracking Understanding user focus and behaviour can be challenging and may require further research and testing. * Potential Performance Bottlenecks Real-time data processing and the need for frequent updates to the UI could create performance challenges, particularly as the user base grows. | |

This research provided useful insights that helped shape AGA's features and design. By examining the strengths and challenges of Carswell’s project, including his use of a real-time task tracker and customised tools to strengthen user engagement, AGA aims to create an effective, user-friendly design and a reliable system setup that is well-suited to the needs of individuals dealing with ADHD.

# System Design

This chapter outlines the design of the proposed system, detailing the methodology, system architecture, and the key components necessary for implementation. It provides a structured blueprint for the development process of AGA.

## Software Methodology

### Development Methodology

|  |  |  |
| --- | --- | --- |
| The development methodology for this project primarily draws from the traditional Waterfall model, providing a structured and linear approach to project planning and implementation. However, elements of the Agile methodology are incorporated throughout the process to introduce flexibility and iterative development. | | Mastering the Waterfall Methodology: An In-Depth Look | Motion *Figure 12. Waterfall Methodology* |
| The traditional Waterfall model establishes a clear sequence of phases - *requirements gathering, design, implementation, testing, deployment,* and *maintenance* - ensuring that all steps are well-documented providing a strong foundation for project management and ensures that key milestones are met in a structured manner. | | |
| What is the Agile Methodology in Software Development? | by Serena Gray |  Medium  *Figure 13. Agile Methodology* | To complement this, an Agile approach is integrated, allowing the project to adapt to changes and continuously improve through *iterative cycles,* or *sprints*.  Each sprint includes planning, task allocation, execution, review, and adjustment phases. This iterative method allows a quick response to feedback, address issues as they arise, and enhance project quality progressively. | |
| *“Agile teams also believe in continuously evaluating project plans and objectives. As a result, they are highly flexible and can quickly adjust to change…Adopting the Agile method will allow you to operate in a detail-oriented manner.”* (Team, 2022) | | |
| By combining the detailed planning of the Waterfall model with the adaptability of Agile, this hybrid methodology ensures both a clear project direction and the ability to refine and enhance the project based continuous evaluations and user feedback. This approach helps maintain high-quality deliverables while meeting the dynamic needs of the project. | | |

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*Figure 14. Hybrid Waterfall and Agile Methodology*

*More information regarding task distribution in 6. Project Management (6.1 Project Plan).*

## Overview of System

The system is designed with three primary components to ensure smooth operation and interaction: a *frontend UI*, a *backend server*, and a *database*.

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| --- | --- |
| **Frontend UI** | Built using Next.js, React, TypeScript, Tailwind CSS, HTML, CSS, and JavaScript, the frontend provides a responsive and accessible web interface across desktops, laptops, tablets, and mobile phones. |
| **Backend Server** | Handles authentication (via Firebase Auth), processes user inputs, and manages feature functionalities. |
| **Database** | Used Firebase Firestore - it stores structured user data including tasks, mood logs, and account settings. It supports real-time syncing and reflects changes instantly across all connected devices |

Hardware elements are integrated with the backend database to retrieve and store data. Python is used to handle interactions between the hardware and users, enabling features like focus detection, audio prompts, and task updates.

### System Architecture

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| MVC Architecture - Detailed Explanation - InterviewBit *Figure 15. MVC Architecture* | | This project adopts the Model-View-Controller (MVC) architecture to ensure maintainability and scalability achieving a robust structure that supports efficient data handling, responsive UI, and a seamless user experience for the web application. |
| **Model** | The database (Firebase) serves as the model, managing user data, task lists, preferences, and other information in real-time. | |
| **View** | The user interface is built using Next.js framework, ensuring responsive interaction across devices. | |
| **Controller** | Next.js handles the server-side logic, API requests, and routing to connect the user interface with the underlying data and services, such as OpenWeather and OpenAI API. | |

## Requirement Analysis

### Use Case Diagrams

These diagrams help in identifying system requirements and ensuring that all user needs are addressed effectively.

In the context of this project, the term *user* refers primarily to individuals with ADHD, who are the main target audience for AGA’s features and functionalities. Secondary users, such as students and other individuals seeking tools for productivity and focus, are also considered.

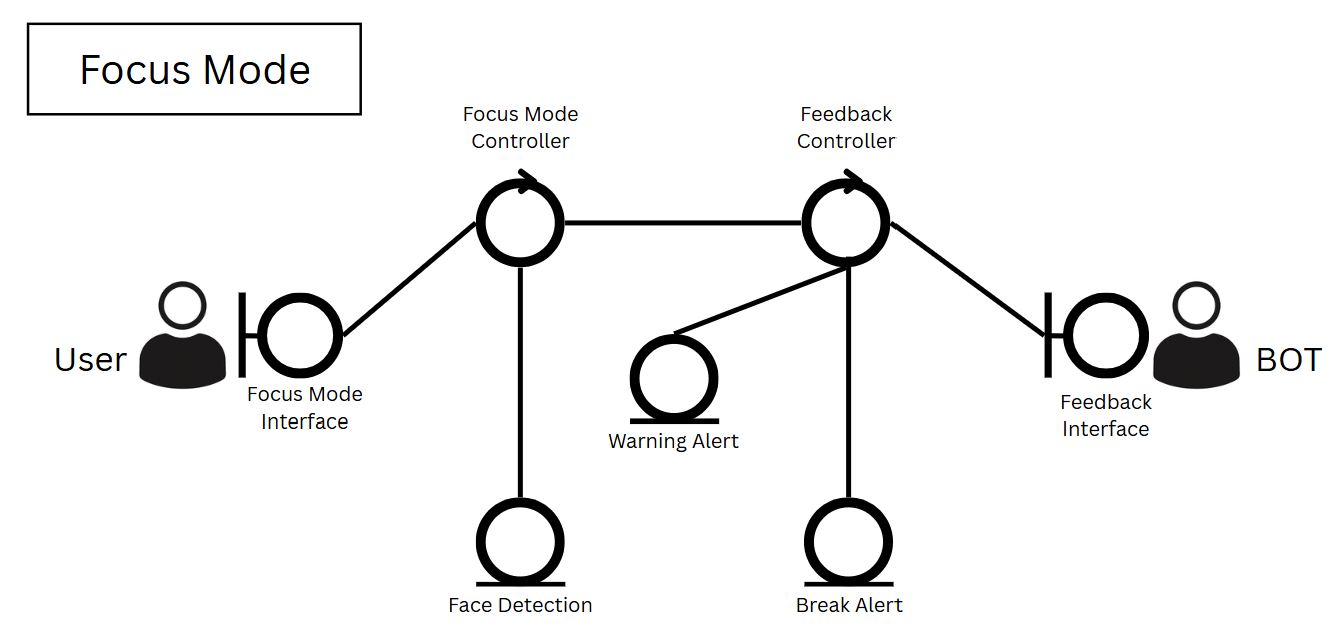
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| *Figure UC1. Use Case 1 Using AGA System*  *(UML2)* | | | |  |  | | --- | --- | | **Use Case 1:** Using AGA System | | | **Goal** | User can use AGA’s tools. | | **Preconditions** | User requires a verified account. | | **Postconditions (Success)** | User can access AGA’s tools. | | **Postconditions**  **(Failed)** | User is unable to access AGA’s tools due to unverified account. | | **Actors** | Users (Individual with ADHD or Student) | | **Trigger** | User wants to use AGA’s system | | **Description** | User logins/create an account to use the tools AGA offers. | | **Priority** | High | | |
| **Main Flow (MF)** | | | | |
| **Step** | **Action** | | | **Alternate** |
| 1.1 | System prompts for user access details | | |  |
| 1.2 | User inputs their user details | | | EF.1.2 |
| 1.3 | System verifies user details are correct | | | EF.1.3 |
| 1.4 | System gives access to the user and directs to AGA’s base page | | |  |
| 1.5 | User accesses AGA’s tools on the web application | | | End of MF |
| **Exceptions or Error Flows** | | | | |
| **Exception/Error Flow 1.2:** MF.1.2 User does not have an account | | | | |
| 1.1 | User registers an account | | | MF.1.1 |
| **Exception/Error Flow 1.3:** MF.1.3 User input incorrect user access details | | | | |
| 1.1 | System prompts user of the error – *‘Incorrect email or password’* | | |  |
| 1.2 | User re-enters user access details | | | MF.1.3 |
| **Non-Functional Requirement** | | | | |
| **Adherence to Legal Principles** | | Ensures compliance with data protection and privacy laws such as GDPR. | | |
| **Regulation and Law** | | Users should meet the standard age to access the website. | | |
| **Data Minimisation** | | Collects only the minimum necessary data for functionalities. | | |
| **Purpose Limitation** | | Uses data solely for its stated purpose with transparency to users. | | |
| **Consent Management** | | Requires explicit user consent before data collection or sharing. | | |
| **Data Retention Policy** | | Retains data only as long as necessary for its intended purpose. | | |
| **Data Integrity** | | Maintains data accuracy, completeness, and reliability. | | |
| **Right to Erasure** | | Ensures compliance with data protection and privacy laws such as GDPR. | | |

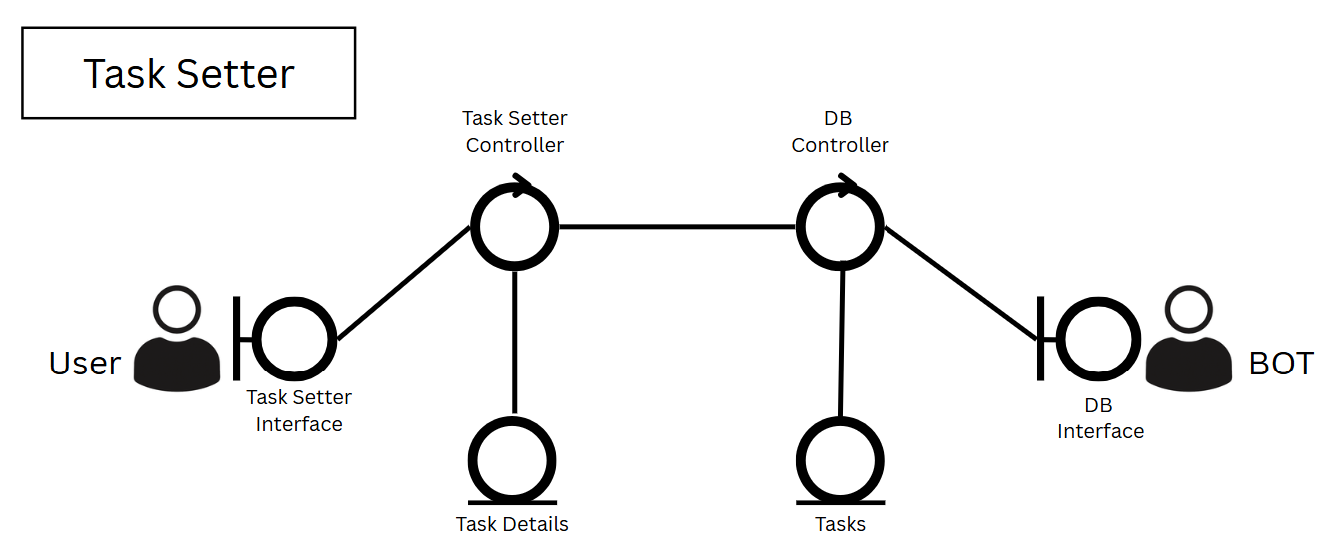
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| *Figure UC2. Use Case 2 Focus Mode*  *(UML2)* | | | |  |  | | --- | --- | | **Use Case 2:** Focus Mode | | | **Goal** | User completes a task | | **Preconditions** | AGA is set in front of User where their eyes are visible, and Focus Mode is enabled | | **Postconditions (Success)** | AGA can detect User’s concentration level and provide appropriate feedback | | **Postconditions**  **(Failed)** | AGA is unable to deliver its service due to system or hardware error | | **Actors** | User, AGA Bot | | **Trigger** | User wants to study/work therefore enabling Focus Mode | | **Description** | User sets AGA on Focus Mode to start studying/working. AGA enables its camera to detect and alert user accordingly to complete task. | | **Priority** | High | | |
| **Main Flow (MF)** | | | | |
| **Step** | **Action** | | | **Alternate** |
| 1.1 | User sets AGA in front of them and enables focus mode | | | EF.1.1 |
| 1.2 | AGA Bot alerts user they are detected | | |  |
| 1.3 | User starts task | | | EF.1.3 |
| 1.4 | User hyper fixates on task | | |  |
| 1.5 | AGA Bot turns blue and alerts user to take a break | | | AF.1.5 |
| 1.6 | User continuous to work on task and completes it | | | End of MF |
| **Exceptions or Error Flows** | | | | |
| **Exception/Error Flow 1.1:** EF.1.1 AGA is unable to detect User | | | | |
| 1.1 | System prompts that it is unable to detect user | | |  |
| 1.2 | User re-positions AGA Bot | | | MF.1.1 |
| **Exception/Error Flow 1.3:** EF.1.3 User loses focus on Task | | | | |
| 1.1 | AGA Bot turns red and alerts user to return to Task | | |  |
| 1.2 | User returns to the task | | |  |
| **Alternative Flows (AF)** | | | | |
| **Alternative Flow 1.3:** AF.1.5 User loses focus on Task | | | | |
| 1.1 | User takes a break | | |  |
| 1.2 | User returns to task | | | MF.1.6 |
| **Non-Functional Requirement** | | | | |
| **Camera Security and Usability Restrictions** | | Limits camera functionality to protect user safety and privacy. | | |

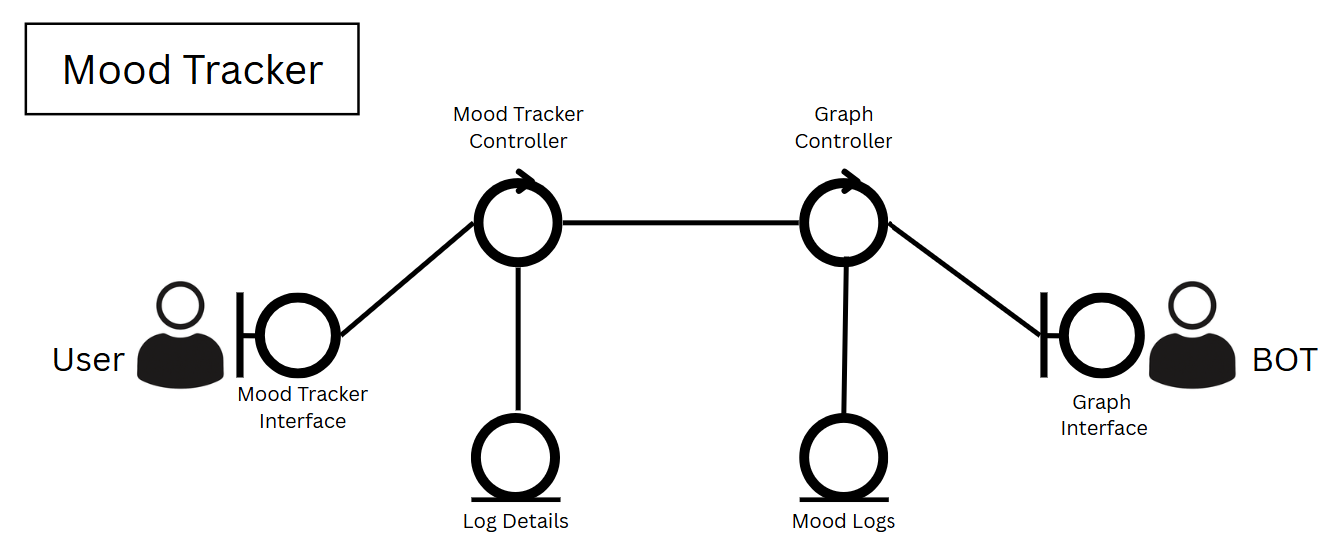
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Figure UC3. Use Case 3 Task Setter*  *(UML2)* | | | |  |  | | --- | --- | | **Use Case 3:** Task Setter | | | **Goal** | User can add task and get a clear view of what to prioritise first | | **Preconditions** | User is logged into account | | **Postconditions (Success)** | Task is added onto scheduler ordered in high to low priority | | **Postconditions**  **(Failed)** | Task is not saved on scheduler | | **Actors** | User, DB, Web Application | | **Trigger** | User needs a reminder for a task | | **Description** | User adds a task on scheduler, adding the description, date, time and priority weight. | | **Priority** | High | | |
| **Main Flow (MF)** | | | | |
| **Step** | **Action** | | | **Alternate** |
| 1.1 | User creates a task adding description, date, time and weight priority | | |  |
| 1.2 | System checks double scheduling | | | EF.1.2 |
| 1.3 | System adds task in DB | | |  |
| 1.4 | System displays tasks in order of priority weight | | |  |
| 1.5 | User opens the days’ task lists to have a clear view of what to prioritise first | | | End of MF |
| **Exceptions or Error Flows** | | | | |
| **Exception/Error Flow 1.2:** EF.1.2 Double Scheduling of Task | | | | |
| 1.1 | System prompts user there is a task scheduled during this time | | |  |
| 1.2 | User confirms | | |  |
| 1.3 | System blocks enough appropriate time for these tasks to be completed on calendar | | | AF.1.3 |
| 1.4 | System adds task and orders the tasks in high to low priority | | | MF.1.4 |
| **Alternative Flows (AF)** | | | | |
| **Alternative Flow 1.3:** AF.1.3 Not enough time to add new task | | | | |
| 1.1 | System prompts user it is unable to add task due to lack of time space | | |  |
| 1.2 | User updates time or date | | | MF.1.2 |
| **Non-Functional Requirement** | | | | |
| **Data Minimisation** | | Collects only the minimum necessary data for functionalities. | | |
| **Purpose Limitation** | | Uses data solely for its stated purpose with transparency to users. | | |

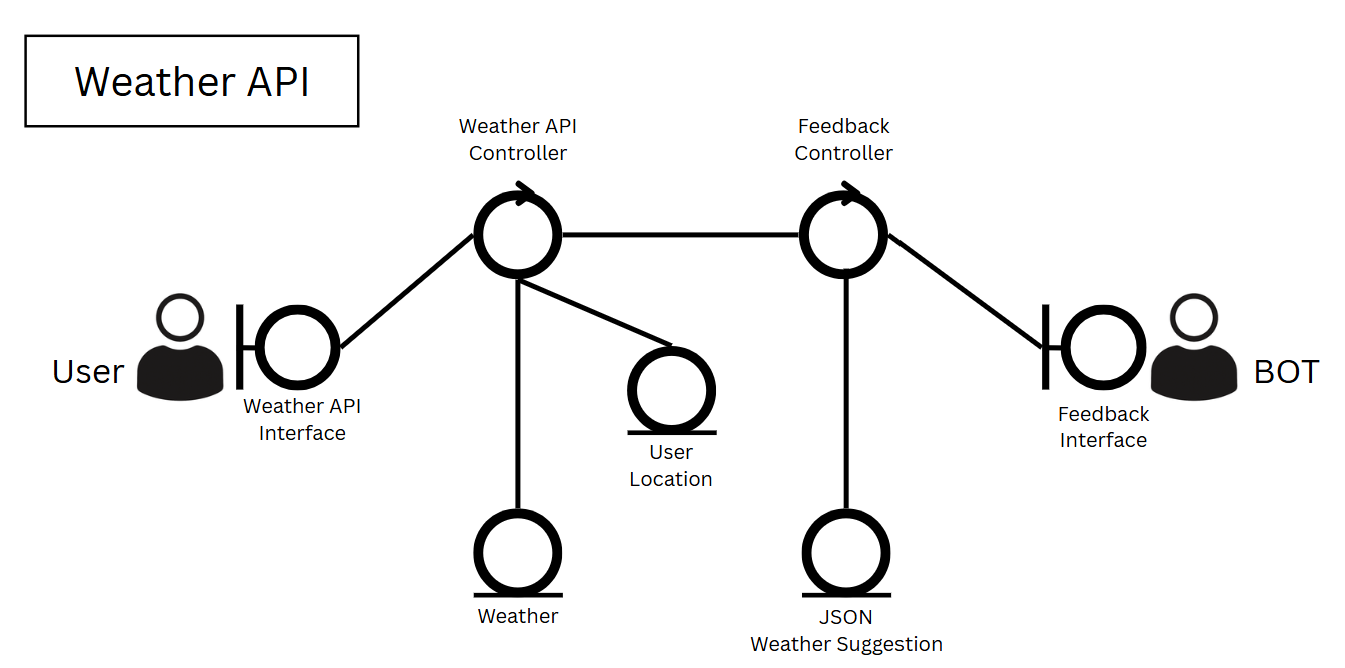
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Figure UC4. Use Case 4 Mood Log*  *(UML2)* | | | |  |  | | --- | --- | | **Use Case 4:** Mood Log | | | **Goal** | Allow user to visually analyse the mental progression in a weekly or monthly basis. | | **Preconditions** | User is logged into account | | **Postconditions (Success)** | User logs mood activity and display logs into a visual graph | | **Postconditions**  **(Failed)** | Web App is unable to fetch logs from DB to produce a graph | | **Actors** | Actor, DB, Web App | | **Trigger** | User accesses account to check their mental progression | | **Description** | User is prompted to log mood activity, and a graph is displayed of weekly or monthly logs | | **Priority** | Mid | | |
| **Main Flow (MF)** | | | | |
| **Step** | **Action** | | | **Alternate** |
| 1.1 | User access AGA’s Web App | | |  |
| 1.2 | System prompts user to log mood activity | | | AF.1.2 |
| 1.3 | User logs mood | | |  |
| 1.4 | System saves logs into the database | | |  |
| 1.5 | System displays logs in a visual graph | | | EF.1.5 |
| 1.6 | User switches between weekly or monthly graphs | | | End of MF |
| **Exceptions or Error Flows** | | | | |
| **Exception/Error Flow 1.5:** EF.1.5 Unable to fetch data from database | | | | |
| 1.1 | System displays an empty graph with an error message | | |  |
| 1.2 | User reports technical issue | | |  |
| 1.3 | Support service fixes the technical issue | | | MF.1.5 |
| **Alternative Flows (AF)** | | | | |
| **Alternative Flow 1.2:** | | | | |
| 1.1 | User cancels/exits the prompt | | |  |
| 1.2 | System sets a timer and asks again or next time user accesses the web app again | | | End of AF |
| **Non-Functional Requirement** | | | | |
| **Data Minimisation** | | Collects only the minimum necessary data for functionalities. | | |
| **Purpose Limitation** | | Uses data solely for its stated purpose with transparency to users. | | |
| **Consent Management** | | Requires explicit user consent before data collection or sharing. | | |
| **Data Retention Policy** | | Retains data only as long as necessary for its intended purpose. | | |
| *Figure UC5. Use Case 5 Weather API*  *(UML2)* | | | |  |  | | --- | --- | | **Use Case 5:** Weather API | | | **Goal** | Identify what weather it is and prepare appropriately | | **Preconditions** | Connected to Weather API and JSON file for suggestions | | **Postconditions (Success)** | Web App/AGA Bot can suggest what user should prepare for the day | | **Postconditions**  **(Failed)** | Unable to read weather API/JSON file to provide suggestion | | **Actors** | User, Weather API, Web App/AGA Bot | | **Trigger** | User is looking for suggestions base on weather | | **Description** | User prompts system for weather suggestion, system checks weather, compares the findings to JSON file to provide appropriate suggestions | | **Priority** | Mid | | |
| **Main Flow (MF)** | | | | |
| **Step** | **Action** | | | **Alternate** |
| 1.1 | User accesses Web App | | |  |
| 1.2 | User prompts the Weather Tool | | |  |
| 1.3 | System checks user’s location | | | EF.1.3 |
| 1.4 | Weather API checks weather for that location | | | EF.1.4 |
| 1.5 | System reads JSON file based on weather findings | | |  |
| 1.6 | System suggests user appropriately | | | End of MF |
| **Exceptions or Error Flows** | | | | |
| **Exception/Error Flow 1.3:** EF.1.3 User’s Location is disabled | | | | |
| 1.1 | System prompts user for location access permissions | | |  |
| 1.2 | User enables location on | | | MF.1.3 |
| **Exception/Error Flow 1.4:** EF.1.4 Weather API is not working | | | | |
| 1.1 | System prompts user that the Weather tool is facing a technical issue | | |  |
| 1.2 | System refreshes in the background | | | MF.1.2 |
| **Non-Functional Requirement** | | | | |
| Adherence to Legal Principles | | Ensures compliance with data protection and privacy laws such as GDPR. | | |
| Consent Management | | Requires explicit user consent before data collection or sharing. | | |
| Data Retention Policy | | Retains data only as long as necessary for its intended purpose. | | |
| Data Integrity | | Maintains data accuracy, completeness, and reliability. | | |

### Class Analysis

  
*Figure CA1. Class Analysis Focus Mode*

  
*Figure CA2. Class Analysis Task Setter*

  
*Figure CA3. Class Analysis Mood Log*

  
*Figure CA4. Class Analysis Weather API*

### Class and Sequence Diagram

#### Focus Mode

A diagram of a diagram

Description automatically generated with medium confidence  
*Figure SD1. Informal Sequence Diagram Focus Mode*

*A screenshot of a computer program

Description automatically generated  
Figure CD1. Class Diagram Focus Mode*

A diagram of a diagram

Description automatically generated  
*Figure SD2. Formal Sequence Diagram Focus Mode*

#### Task Setter

A screenshot of a computer program

Description automatically generated  
*Figure A13. Class Diagram Task Setter*

A diagram of a task

Description automatically generated  
*Figure SD3. Formal Sequence Diagram Task Setter*

### Database Diagram (ERD)

|  |  |
| --- | --- |
| *Figure ERD1. Entity Relation Diagram* | Key System Relationships **Weather API to User (1 to 1)**  Weather suggestions provided by the Weather API are personalised for individual users, such as recommendations tailored to their location or preferences.  **User to Task (1 to Many)**  A single User can create multiple Tasks, but each Task is associated with only one User.  Users are responsible for creating and managing their own tasks, and this relationship ensures that tasks are directly associated with their creator.  **Task → Focus Mode to Task (1 to 0..1)**  Focus Mode functionality is tied to a specific task to monitor the user’s concentration during that task.  *\*However, Focus Mode can be used even if Task is not on Scheduler for Focus Detection Tool purposes.* |
| **Mood Log (1 to Many)**  A single User can have multiple Mood Log entries, but each Mood Log belongs to only one User.  Mood logs allow users to track and analyse their emotional state over time. Each entry is tied to the user who recorded it.  **Task to User**  Tasks include a foreign key UserID to link tasks to their creators.  This ensures that all tasks are associated with a valid user, maintaining the integrity and reliability of the database. | |

## Project Design

### Project Sitemap

A diagram of a software company

Description automatically generated with medium confidence  
*Figure 14. Sitemap*

### Web App GUI Prototype

|  |  |
| --- | --- |
| A screenshot of a blue square with green eyes and a green square with green text  Description automatically generated *Figure B1. Web App GUI Sign In/Up* | A screenshot of a computer  Description automatically generated *Figure B2. Web App GUI Landing Page* |
| A screenshot of a website  Description automatically generated *Figure B3. Web App GUI Landing Page: About* | A screenshot of a computer  Description automatically generated *Figure B4. Web App GUI Main Page: Tools* |
| A screenshot of a computer  Description automatically generated  *Figure B5. Web App GUI Profile/Setting Page* | A screenshot of a website  Description automatically generated *Figure B6. Web App GUI Contact Us Page* |

### AGA Bot GUI Prototype

A blue cube with a leaf on top

Description automatically generatedA cartoon of a plant

Description automatically generatedA blue cube with a leaf on top

Description automatically generated  
*Figure C1. AGA Bot Using 3D Model*

A cartoon of a plant

Description automatically generatedA blue square with a question mark and a leaf

Description automatically generatedA cartoon of a blue square with a green leaf on top

Description automatically generatedA blue square with a leaf on top

Description automatically generated  
*Figure C2. AGA Bot Expressions Using 3D Model*

A blue background with black ovals

AI-generated content may be incorrect.A blue background with black arches

AI-generated content may be incorrect.A blue background with black arches

AI-generated content may be incorrect.A blue background with black circles

AI-generated content may be incorrect. A pair of black eyes

AI-generated content may be incorrect.A black oval and a blue background

AI-generated content may be incorrect.A pair of black hearts on a blue background

AI-generated content may be incorrect.A blue background with black symbols

AI-generated content may be incorrect.  
*Figure C3. Updated Bot Expressions  
Neutral, Happy, Excited, Annoyed, Bored, Wink, Love and Bubbly expressions.*

|  |  |
| --- | --- |
| A clock with numbers and date  AI-generated content may be incorrect. *Figure C4. Home* | A screenshot of a phone  AI-generated content may be incorrect. *Figure C5. Main Menu* |
| A black and white clock  AI-generated content may be incorrect. *Figure C6. Focus Mode* | A white triangle with a exclamation mark on it  AI-generated content may be incorrect. *Figure C7. Warning Message* |
| *Figure C8. Break Message* | *Figure C9. Data Analysis* |

A screenshot of a computer

AI-generated content may be incorrect.  
*Figure C10. AGA’s Base Navigation*

A diagram of a system

AI-generated content may be incorrect.  
*Figure C11. AGA’s Focus Mode Functionality Map*

## AGA Setup Manual

### Website Application

* + 1. Git clone: [*https://github.com/vedez/AGA/tree/main/aga-website*](https://github.com/vedez/AGA/tree/main/aga-website)
    2. Install and run the website locally:

*cd aga-website*

*npm install*

Edit .env file for Firebase credentials with own.

*npm run dev*

* + 1. Or, you may run the hosted website: [*https://aga-website-cb757.web.app/*](https://aga-website-cb757.web.app/)

### AGA Companion Device

#### Setup Pi

1. Install 32 Bit Pi OS using Raspi Imager
2. Boot into Pi either using HDMI or SSH (Setup during imager step)
3. Install updates
   1. Sudo apt update
   2. Sudo apt upgrade
4. Install drivers for LCD screen
   1. git clone *https://github.com/waveshare/LCD-show.git*
   2. cd LCD-show/
   3. chmod +x LCD35B-show
   4. ./LCD35B-show
5. Pi will reboot and screen should work

### Install AGA

1. Git clone: [*https://github.com/vedez/AGA/tree/main/aga-bot*](https://github.com/vedez/AGA/tree/main/aga-bot)
2. *cd aga-bot*
3. *pip install numpy dlib kivy opencv-python*
4. *python main.py to run program*

# Testing and Evaluation

The testing process was divided into three key phases to ensure a thorough and well-rounded evaluation of the project: feasibility, feature and UI & UX testing.

## Feasibility Testing

As part of the feasibility testing process, a questionnaire was developed to gather user feedback on the proposed system. This questionnaire is included in the appendix under Appendix: Testing Forms as *Figure T1. Questionnaire Form*.

### Understanding User’s Needs: Results

|  |
| --- |
| ADHD and Daily Life Questionnaire |
|  |
| **Understanding ADHD and Daily Challenges** |
| In your own words, how would you describe ADHD and how it affects you personally?   1. For me it's a combination of inability to focus and issues with executive functioning. I also believe hyperactivity is one too though I think I lean on the inattentive side I do fidget a lot. 2. It is an inability to keep to a routine, a lack of motivation, and an inability to focus. I run out of time for everything I want to do, even just for living. 3. It's the reason it takes me three times as long as everyone else to do something, and the reason I have to work much harder than everyone else to get to the same level of skill as everyone else. 4. ADHD feels like a changing puzzle. The puzzle keeps changing so its hard to complete it. This is how it feels like it my life, where I think I know what I need to do and suddenly, my entirety wants to do something else. Its hard to be consistent. |
| What obstacles or challenges do you experience daily due to ADHD?   1. The biggest obstacles I face are taking care of myself so hygiene, remembering to brush my teeth hair, and managing to remember tasks I must do, finding motivation to do this tasks, and organizing and cleaning. Another one since I am a student is focusing in long lectures. I can't keep my attention no matter how hard I try sometimes. And the biggest one when it comes to homework is being able to start the assignment. 2. I can't get organized or complete necessary tasks in a very timely way. It sucks. 3. Getting started. Lately, I just seem to zone out for a long time until getting started becomes an emergency. That, and sleeping. I can't keep a sleep schedule to save my life. 4. I cant meet my deadlines unless there is pressure which also affects the quality of my performances on these tasks. I jump into different tasks due to the overwhelming tasks adding into my list unexpectedly which sometimes paralyses me into doing these tasks. I stress the same in different types of tasks even if its not important and do these over what is important as I don’t distinguish them properly. |
| How do you typically overcome these obstacles or manage them?   1. The best things that work for me are external motivators. Like if someone's coming over or I make this promise to someone I will do it and they hold me accountable. I'm still figuring it out how to navigate this though. I also always try to set reminders on my phone to send me a notification if I need to remember something like an appointment. Another useful thing I've found for homework and studying is working at a time I'm least tired and in a quiet study room by myself with minimal noise and distractions. And access to snacks and water too so I don't get distracted and leave to find food. 2. I got medicated which helps a lot. I became better able to use a planner and reminders once I knew why I was struggling so much 3. I'm pretty old now, so I've just kinda learned how to tell what's going on, and then I talk myself through it. That, and fear. When I get to the point where something is now urgent, and hence fear inducing, I am good, and I can get moving. 4. I meditate – breathing exercise, etc. I write down what I need to do so I don’t have to keep them constantly ticking in my head. |
| **Current Tools and Resources** |
| What applications or activities do you currently use to help manage your daily routine?   1. I don't know if I have much other than using reminders on my phone as of right now. I also have used todo lists and schedules to time when my classes are. But I do forget them a lot. 2. I use several digital calendars to keep track of my reminders because I can ask siri to create a calendar event really quickly (apple calender), use my outlook app to autocreate events when I read the email that the details come in, Use google calendar to see when my job has scheduled me (I just have a babysitting gig that the parent gives me a google calendar schedule)   I use onenote to keep a list that can be accessed on both my laptop and my phone. Its essential that I be able to add things when I think of them.  I use waterllama to remind me to drink water.   1. GDT, Freedom App, Kanbans, calenders, whiteboards, and lots of excercise. 2. Ive tried mamy different apps, mostly schedulers, lists, reminder types of apps. Unfortunately, I forget about them and never actually use them. |
| What do you like most about the current services or tools you use?   1. In terms of reminders on my phone I like that it'll notify me at that time and is pretty simple. 2. N/A 3. N/A 4. For example, I use the reminders app of iOS on my watch. It has time and date setters which I put on repetition, and I am reminded of the task on a weekly basis. |
| What do you dislike about these services or tools?   1. What I don't like is sometimes the effort to do it feels difficult for whatever reason. Or if my phone bugs and never sends a notification. 2. I dislike how I can't easily consolidate the calendars into one. Onenote requires a subscription to use. Waterllama is fine design-wise but I forget to use it. 3. They don't really work all the time, and I have to pay for them. 4. It requires so much effort to set up which then demotivates me as Ive already invested so much mental strength preparing it. |
| **Desired Features** |
| What features are you looking for in apps or tools designed to support ADHD?  *Which features have been most helpful for you? Which features have not worked or been effective for you?*   1. I don't use many applications. I genuinely have motivation at the start but then I forgot about them usually. I feel like maybe those apps I see online like ones that gamify tasks could be cool? I haven't used them in a while but my forgetfulness to use it is tricky. Maybe something cool could be things to really customize experiences. Like if I could put my own drawing or pictures as a theme or icon or something, it might make it more exciting. Or if they added funny things to it like funny sound effects you can add to make the app more entertaining. Funny messages maybe. 2. I love having widgets that I am forced to see when I scroll past them. 3. Freedom because it locks me out of distractions. It does'nt always work anymore though, because I spent like three days once figuring out how to unlock it and defeat it. Whiteboards are the biggest help for me. 4. I want a product that is hard to miss, forget. Maybe a reward system? Something that will help my inconsistency. |
| **Proposed Solution** |
| Would you find a keychain device that consistently reminds you of your tasks and monitors your study/work progress helpful in managing ADHD? Why or why not?   1. For me I don't. I've tried before but sometimes I just forgot why it's there or I'll procrastinate on it so much and then the keychain will blend in and I forgot. This happens with notifications too if I set one for every day it blends in and my brain tunes it out unfortunately. So they generally need to be novel and different each time for it to work. 2. Nope, I don't use my car everyday and am not likely to see it in a timely manner. I also frequently lose my keys because I only think about them when I need them. I don't even notice the keychains I have on my keys right now. 3. Probably not. I have a phone that can do that, and I ignore it most of the time anyway, until whatever it is becomes an emergency. 4. Yes and no, I may use it a lot at the start but just like my apple watch, there are days I forget about it for weeks on end |

### Findings

Referencing the questionnaire, it was evident that while individuals with ADHD appreciate tools designed to assist them, many existing solutions fail to address the core issues of forgetfulness, demotivation, and inconsistency. Features customisation and high visibility are in demand, while tools that are repetitive, complex, or require high mental effort are often abandoned.

|  |  |
| --- | --- |
| **Understanding ADHD and Daily Challenges** | **ADHD Characteristics**  ADHD is often characterised by difficulty focusing, challenges with executive functioning, hyperactivity, and inconsistency in routines. Individuals frequently feel overwhelmed by tasks as their attention and focus shift constantly, resulting in frustration and inefficiency. Metaphors such as a "*changing puzzle*" capture the internal struggle, reflecting the unpredictability of focus and motivation experienced by those with ADHD.  **Common Challenges**  Individuals with ADHD often face significant challenges in initiating tasks, particularly in the absence of external pressure or deadlines. Difficulties with organisation, time management, and maintaining routines are common, leading to high levels of procrastination, zoning out, and unexpectedly switching between tasks. Overwhelming task lists can become paralysing, causing individuals to focus on less important tasks while neglecting those that are more urgent.  **Methods of Coping**  External motivators, such as accountability partners or reminders, can be instrumental in helping individuals with ADHD stay on track. Techniques like writing down tasks, practising meditation, and using breathing exercises are often effective for self-regulation. Additionally, digital tools such as planners, calendars, and notifications provide valuable support in remembering tasks, although their effectiveness can vary depending on individual needs and preferences. |
| **Current Tools and Resources** | The individuals often rely on a combination of tools to manage their tasks and routines, including phone reminders, digital calendars such as Apple or Google, and task management apps.  Additionally, some individuals use specialised apps, such as *Freedom* to block distractions and *Waterllama* to encourage hydration.  **Positive Notes**   * Simple notifications and reminders were seen as effective for staying on top of tasks. * Repetitive or consistent alerts are useful.   + This will be addressed by the Reminder feature (planned for future implementation), where AGA will read out the tasks for today—morning and lunch—and provide a preview of tomorrow’s tasks to help users prepare. * Integration across multiple devices, such as phones and laptops, made tools easier to use.   + A web application was chosen to ensure that features are easily accessible across a wide range of devices.   **Negative Notes**   * Discouragement on tools that require significant effort to set up. * Notifications and reminders often become repetitive or easy to ignore over time, reducing impact.   + AGA’s facial expressions and interactive UI help make reminders fun and something users can look forward to. * Some apps require subscriptions or payments, which can be off-putting. |
| **Desired Features** | **What Users Wants:**   * **High visibility**   Features such as widgets or unavoidable reminders to increase accountability.   * **Customisation**   The ability to personalise apps, such as adding personal icons, images, or themes, to make them more appealing.   * **Physical presence**   A product that is hard to forget or miss, such as a device always in sight, to ensure consistency.   * **Reward systems**   Features that encourage progress by offering small, tangible incentives.  **Avoid:**   * Overly complex setups that require significant effort to maintain. * Tools or apps that don't adapt to a user's forgetfulness or inconsistency. * Standard notifications or alerts that become repetitive and blend into the background. |
| **Proposed Solution (Keychain Device (AGA Bot))** | The individuals expressed mixed reactions towards the idea of a keychain device, highlighting several concerns.  Common issues included the tendency to forget or lose keys, making the device less reliable. Others worried that a keychain might blend into their environment and eventually be ignored. Others also expressed a preference for tools integrated into their phones or existing devices, as these are already part of their daily habits and more convenient to access.  **Suggested Solution:**   * Some suggested that such a device would only work if it has a way to avoid being ignored. * Suggestions included creating a highly visible, non-intrusive alternative that would encourage consistent use without overwhelming the user. |

## Feature Testing

Each core web app feature — including the Task Setter, Mood Tracker, Weather Tool, and Calendar — was individually tested to ensure functionality, accuracy, and reliability. Additionally, separate testing was conducted on the development and performance of Focus Mode and the interactive features of the AGA bot.

### Web App Feature Testing Form

|  |  |
| --- | --- |
| Task Setter | Done |
| CRUD: Create, Read, Update (mark as done), and Save task from main page |  |
| CRUD: Edit and Delete task from Settings page |  |
| Task Data in DB should include Description, Date, and DOB |  |
| Tasks are ordered by priority |  |
| Main page shows only todays and tomorrow’s tasks |  |
| Backlog shows all tasks regardless of date |  |

|  |  |
| --- | --- |
| Weather Tool | Done |
| Location permission prompts correctly when not enabled |  |
| OpenWeather API retrieves weather based on user’s location |  |
| Displays correct city and country name (Ensure Location is correct) |  |
| Displays appropriate weather icon and temperature |  |
| OpenAI provides preparation suggestions based on weather (*Note: Restriction applied on frequency of prompts to reduce cost of usage)* |  |

|  |  |
| --- | --- |
| Calendar | Done |
| Displays yesterday, today, and tomorrow dates correctly |  |
| Updated logic to affect calendar by translation (*Note: Initially the Language Switch did not change for calendar)* |  |

|  |  |
| --- | --- |
| Mood Tracker | Done |
| CRUD: User can add mood to DB (Mood Log) |  |
| Retrieve mood log and plot "Mood of the Day" on graph |  |
| Verified graphs display correctly using test JSON data |  |
| Language translation applies correctly when switching languages |  |
| Mood Log | Done |
| Check whether the updated UI with colour indicators for different moods and a dragger-style picker has a greater impact . This was done by showing the new and old UI feature to a few individuals and gathering their opinions on which version was better. |  |
| Feedback message displayed after mood is logged to confirm submission |  |
| Affirmation Message | Done |
| Affirmation messages are pulled from a JSON file based on the user’s mood level, using the appropriate category corresponding to that mood. Used fake mood data to test correct affirmation level is shown |  |

### AGA App Feature Testing Form

|  |  |
| --- | --- |
| AGA Bot Interaction and Navigation | Done |
| Single tap allows navigation of the bot |  |
| Double tap triggers interaction with the bot (Bonus Animation) |  |
| Calendar | Done |
| Break marker appears at correct intervals:  – 30 min: 5 min break   – 60 min: 10 min break   – 90 min: 15 min break |  |
| Warning reminder activates if user is undetected for 30 seconds |  |
| Users can resume focus mode by being detected or interacting (*timer resumes from when warning reminder occurred.*) |  |
| If warning remains for 5 minutes (idle), focus mode ends and user returns to home |  |
| Upon ending focus mode, celebrate screen appears. Was unable to implement – *freeze point.* |  |
| Focus session progress is added to today’s Data Insights |  |
| Home | Done |
| Displays correct local time |  |
| Displays correct local date |  |
| Calendar | Done |
| Shows today’s total focus time after session ends |  |
| Displays yesterday’s total work time |  |

## UI & UX Testing

The final phase evaluated the overall design and user experience of the web application. Feedback was gathered from individuals with varying levels of technical expertise to assess ease of navigation, clarity of features, and visual appeal. An Outlook form sheet is provided to retrieve feedback and is included in the appendix under Appendix: Testing Forms as *Figure T2. UI & UX Form*.

### Results and Findings

|  |  |
| --- | --- |
| **Ease of Navigation and Overall Usability** | **High Ease of Use**  All participants rated the application as either Easy or Very Easy to navigate across all tasks. This reflects a consistently user-friendly interface and intuitive design. *Future Implementation may be to improve UI to be more dynamic, applying a tighter grid layout on features in the Main Page.*  **Device Compatibility**  Testing was successfully carried out on various devices including iPhones, laptops, and PCs with ultrawide monitors. The site maintained responsive and had full functionality across all platforms. |
| **User Interface Design** | **Positive Impressions**  Users appreciated the aesthetic appeal of the site, often describing it as “pleasant,” “colourful,” “cute,” and “modern.”  **Visual Feedback Features**  The mood-based affirmation system received positive remarks. Users noted that the mood tracking feature was engaging and added a sense of personal connection.  **Minor UI Suggestions**   * A few users mentioned the icons (particularly in the top right corner) were too small when using the webapp on a phone. * Some requested separate buttons for settings and profile, as the current merged layout was a bit confusing. |
| **Functional Feedback** | **Task Management**  Users found task creation and editing to be quick and straightforward.  **Deactivation Flow**  The deactivation process was described as simple and fast, especially when compared to other applications where deactivation is typically more difficult. One suggestion included adding a message like “We’re sad to see you go” for a more personal touch. |

Overall, the feedback from participants indicates that the AGA web application successfully met its primary goal of delivering an easy-to-use and accessible platform. Users consistently found the website easy to navigate, with clear features and smooth functionality across a range of devices. This ease of use was a key focus during development, and the testing results strongly affirm its success in that area.

While minor suggestions were made - such as improving icon visibility on smaller screens and separating the settings and profile buttons - these did not detract from the overall user experience. There is potential for future improvements to make the UI even more dynamic and straightforward, particularly through a more structured layout on the main page.

Despite these small areas for improvement, user satisfaction was high, and the positive reception of the design, functionality, and interactive features such as mood tracking and affirmations highlights the effectiveness of the application in its current form.

## Interim Testing (Experimental Phase)

## Challenges and Difficulties

A key challenge in developing AGA’s Focus Mode was implementing a system to monitor user concentration by tracking eye movements and detecting ear positions to ensure the user remained engaged with their task. As someone with limited prior experience in this area—particularly in using a Raspberry Pi for such functionality—I initially found it difficult to identify suitable libraries and fully grasp the technical requirements involved.

Another significant obstacle was developing dynamic facial expressions for AGA. These expressions were crucial for enhancing user experience and building a sense of connection between the user and the bot. However, I struggled to find appropriate resources or libraries that allowed for customisable and expressive animations.

These challenges highlight my need to research and a willingness to experiment. I dedicated time to understanding how tools such as OpenCV, Kivy, and Dlib could be applied in this context. This involved learning how OpenCV could support real-time image processing, how Kivy could be used to build a lightweight and responsive UI, and how Dlib offered pre-trained models for facial landmark detection.

Through online tutorials, forums, a dataset found on Kaggle, and by consulting with individuals who have experience in this area, I was able to begin prototyping the basic functionality of the companion device. While many of the tools initially felt overwhelming, continued experimentation and learning helped me better understand how these technologies could work together on the Raspberry Pi to support AGA’s intended features.

## Interim Test Cases

### Focus Mode Testing Plan 01

|  |  |  |  |
| --- | --- | --- | --- |
| **Testing Plan 01** | | Focus Mode Feature | |
| **Objective**  To evaluate the functionality and effectiveness of the Focus Mode feature, ensuring it accurately detects user focus, alerts for loss of concentration, and provides break recommendations after extended focus. | | | |
|  | | | |
| **Testing Scenarios** | | | |
| **1** | Focus Detection | | |
| **Test Case** | | | Verify that the bot accurately detects the user's eyes and ears while in Focus Mode. |
| **Expected Outcome** | | | The bot successfully identifies the user’s presence and confirms they are working/studying. (*Turn Green)* |
| **2** | Loss of Focus Detection | | |
| **Test Case** | | | Scenario where the user looks away or remains still for an extended period. |
| **Expected Outcome** | | | The bot detects the loss of focus and turns red to alert the user. |
| **3** | Break Recommendation | | |
| **Test Case** | | | Users remain focused for 30 minutes or more. |
| **Expected Outcome** | | | The bot recommends a break by turning blue and displaying “*break”.* |
| **4** | Environmental Challenges | | |
| **Test Case** | | | Evaluate the bot’s focus detection in different lighting conditions and with potential distractions in the background. |
| **Expected Outcome** | | | The bot consistently identifies focus or loss of focus, regardless of environmental factors. |

## Bot Facial Expressions Testing Plan 02

|  |  |  |  |
| --- | --- | --- | --- |
| **Testing Plan 02** | | Bot Facial Expressions Feature | |
| **Objective**  To assess the implementation of facial expressions on the bot, ensuring they improve user engagement and enhance the overall experience when interacting with the bot. | | | |
|  | | | |
| **Testing Scenarios** | | | |
| **1** | Appropriate expressions on different cases | | |
| **Test Case** | | | Show that for each case, expression is showed as listed:   |  |  | | --- | --- | | **Happy Expression** | Task completed | | **Neutral Expression** | Idle state or waiting for input | | **Sad Expression** | Error | | **Excited Expression** | Encouragement during focus mode | |

# Prototype Development: Experimental Phase

In this section, I will present code snippets developed during the interim phase, highlighting key functionalities and progress made in the implementation of AGA.

## Focus Mode

Focus Mode is main feature of AGA, designed to help users achieve a balance between their responsibilities and overall well-being. This feature aims to keep users focused on their tasks while also providing gentle reminders to take breaks when they become hyper fixated. This is essential for promoting better wellness management.

The main components of this feature include the ability to detect the user, determine their focus level, and respond appropriately when the user loses focus or becomes hyper focused.

### Face Detection

This code implements a Face Detection system using dlib and OpenCV to monitor a user’s facial movements and concentration. It detects key facial features, such as the eyes and head position, to assess whether the user is focused or distracted. By calculating the *Eye Aspect Ratio* (EAR) and tracking head stability, the system determines if the user is looking at the screen and if their face and body are stable. Based on this information, the system adjusts a bot's expression to indicate whether the user is focused or distracted.

A computer screen with white text

Description automatically generated  
*Figure I1. Calculating EAR*

This section of the code is responsible for detecting whether the user is looking at the screen by calculating the EAR for both eyes – it measures the ratio between certain distances on the eye and is used to detect eye openness. If the avg\_ear is below the threshold, which suggests the user might be blinking or distracted, the *eye\_frame\_count* is incremented to track how long the user has been distracted. This process helps the system assess the user's attention and adjust the bot’s expressions accordingly.

A screen shot of a computer

Description automatically generated  
*Figure I2. Calculating Stability*

The code monitors whether the position of the face or head has shifted significantly between consecutive frames. If either moves beyond the threshold, it is considered unstable, and the frame count for stability is reset. This check ensures that the system can differentiate between intentional movements

A black background with white text

Description automatically generated  
*Figure I3. Updating Last Positions of Individual*

This part ensures that the system can track continuous changes in face and head position over time. Each frame’s result depends on the previous frame’s face/head position, creating a continuous assessment of user stability.

A black screen with white text

Description automatically generated  
*Figure I4. Determine User’s Focus Level (Concentrated/Stable or Distracted)*

*A computer code with white text

Description automatically generated  
Figure I5. Provides Feedback to the user using Bot Expressions*

This logic helps ensure that the system accurately detects user focus and provides feedback, such as alerting the user to refocus when instability or distraction is detected. In *Figure 5.1.E,* it sets the bot to show an alert if it detects the user is either distracted - *based on eye movement* - or their body/facial position is unstable. This is a way to encourage the user to refocus or remain stable.

## AGA’s Facial Expressions

The primary objective of implementing facial expressions on AGA is to enhance user experience by creating a sense of connection and companionship. By creating a bond between the user and the bot, it encourages users to feel more comfortable and open when interacting with AGA.

This openness is important, as it ensures users are more likely to keep AGA nearby and consider the suggestions it provides, therefore, improving its effectiveness in supporting their productivity and well-being.

### Expressions

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | **Happy** | Task completed or triggered every N minute | | **Neutral** | Idle state or waiting for input | | **Alert** | When User loses focus, it prompts an alert face | | **Break** | When User is in focus for N minutes, it prompts a message for break | | A group of white paper with writing on it  Description automatically generated *Figure I6. Face Expressions Prototype* | |
| A black screen with white text  Description automatically generated *Figure 5.2.B Neutral Expression of AGA (Base Face)*  A computer screen with text  Description automatically generated *Figure 5.2.C Building the Happy Expression of AGA*  A black background with white text  Description automatically generated *Figure 5.2.E Building Attitude Expression of AGA*  A computer screen shot of text  Description automatically generated *Figure 5.2.B Building Break Expression of AGA* | | *Figure 5.2.D Building Alert Expression of AGA* |

The variety of expressions, from happy to alert, allows AGA to offer real-time feedback that adapts to the focus state, enhancing its role as an interactive and responsive companion.

## Refining the Approach

During the Interim Phase, I experimented with OpenCV and DLib to understand the fundamentals of face detection, while also using PyGame to create my own facial expressions. Later, I decided to discard my initial code and rebuild the system using a more object-oriented approach. With a deeper understanding of DLib, OpenCV, and Kivy, I transitioned to using images and GIFs to represent AGA’s expressions—resulting in smoother transitions and more natural interactions.

*The design and logic map for the bot can be found in the Project Design section, from Figure C3 to Figure C11, detailing the updated AGA expressions, base navigation structure, and the Focus Mode functionality map.*

# Project Management

This section of the report provides an overview of the project management approach utilised for this project. It covers the project plan, milestone roadmap, development methodology, and task distribution methods, along with supervisor and team engagement strategies and risk management practices.

Each element is discussed to highlight how structured planning, clear communication, and proactive risk mitigation were applied to achieve project objectives effectively. This approach also provided a firm foundation and clear direction, ensuring the project remained focused and well-aligned throughout its development.

## Project Plan

### Milestones & Roadmap

The project plan is divided into four quarters, with each semester consisting of two quarters. The first semester focuses on completing the development of the product, while the second semester is dedicated to the refinement of the product.

A screenshot of a computer

Description automatically generated

*Figure 6.1.1.A Milestones First Semester*



*Figure 6.1.1.B Milestones Second Semester*

The project roadmap is automatically generated in GitHub when creating iterations. By setting up these iterations, GitHub organises the tasks, deadlines, and progress into a clear, visual roadmap. This automated roadmap provides an overview of the project's timeline, making it easy to track each phase’s progress and ensuring that the project stays aligned with its planned schedule.

### Reflection on Timeline and Unexpected Challenges

Although unexpected circumstances arose during the second semester that temporarily halted development progress, these delays did not significantly impact the overall outcome of the project. This was largely due to the groundwork completed during the first semester, where most of the development phase was intentionally front-loaded.

Additionally, time allowances were purposely built into the project schedule to accommodate unforeseen issues, ensuring that there was still sufficient time for implementation and refinement before the final deadline. The FYP board’s provision of a one-week extension further supported this timeline, allowing improvements to be made to the final report and overall presentation of the project.

### Task Distribution

Tasks are organised by priority and distributed across the following stages to maintain a streamlined workflow.

|  |  |
| --- | --- |
| **To Do**  This stage includes all pending tasks, organised by labels such as *Stories, Tasks, and Bugs*. Each item represents a possible issue or feature for the project.  Uncompleted tasks stay in the backlog until allocated catch-up time. | **In Progress**  Tasks are tackled one at a time to help maintain focus and prevent overwhelming scenarios. Stories are broken down into manageable tasks, which are completed individually to maintain a clear path from "to do" to "done." |
| **Review & Testing**  Completed features are submitted in a different branch, where they undergo review and testing. Once a feature meets standards, it is merged into the main project branch, reducing bugs and maintaining quality. | **Done**  Tasks are marked as "done" once they meet all requirements and quality standards. In this project, the definition of "done" means that the feature fulfils all specified requirements and has little to no bugs. Minor bugs that do not significantly impact the project can be logged as separate bug tasks to be addressed during review or allocated catch-up time. |

## Supervisor Engagement

Dr. Bojan Božić is an Assistant Lecturer in Computer Science at TU Dublin with extensive expertise in Semantic Web, Machine Learning, and Data Science. He will be supervising the development of my fourth-year project, *AGA*.

*More information could be found at* [*https://www.tudublin.ie/explore/faculties-and-schools/computing-digital-data/school-of-computer-science/people/academic-staff/bojanbozic.php*](https://www.tudublin.ie/explore/faculties-and-schools/computing-digital-data/school-of-computer-science/people/academic-staff/bojanbozic.php)*.*

### Meeting Availability

|  |  |
| --- | --- |
| Tuesday | 14:00 – 15:00 |
| Wednesday | 11:00 – 15:00 |
| Thursday | 11:00 – 15:00 |

#### Types of Meeting

* **Catch Up**
  + A quick catch-up meeting regarding what has been completed during the week. This could either be delivered via on-site/online meeting or re-cap document sent via email.
  + Time duration: 15 minutes max.
* **Review**
  + This meeting reviews bigger accomplishments - *features, testing, etc… -* to discuss about what has been completed, possible changes to apply, and general feedback of these tasks.
  + Time duration: 30 minutes max.
* **Retrospective**
  + This meeting opens feedback regarding communication and the handling of the project if any aspects need to be changed or continued. This is important to ensure morale and strengthens communication of the team.

## Risk Management

### Technical Risks

* **Software Bugs and Errors**

Mitigated through regular testing and continuous review of the issue board. Non-functioning features should be flagged immediately and either fixed within the current iteration or added to the backlog for scheduled review and correction.

* Feature Testing: Testing is applied on every feature built and updated.
* Minor errors that may not heavily impact the feature’s functionality is placed in a backlog.
* **Version Control**

Use branches to manage different versions of the code, merging only after code has passed review to reduce bugs in the main project. Labelling “done” in the definition stated in *Task Distribution.*

* **Security and Authorisation**

Object-Oriented Programming (OOP) principles were implemented by using components to build the web application and widgets to develop the companion device.

### User Risks

* **User Satisfaction and UX Failures**

Addressed through UX testing cases that prioritise user feedback to enhance usability. This is the top priority during the second semester for code implementation.

* From Testing and Evaluation, *UI & UX Testing*
* **User Communication**

Engaging with users to understand their needs is essential, focusing on features that benefit their experience and usability of the application.

* From Testing and Evaluation, *Feasibility* *Testing*

### Project Management

* **Time Constraints**

Each task or story is estimated for time, with allowances for unexpected delays by incorporating buffer time into the schedule.

* **Scope Creep**

Clearly define the project scope, prioritising core features. Additional requests or features are added to the backlog to address only if time allows, ensuring focus and avoiding overloading tasks.

* **Freeze Point**

Establish a *"freeze point"* where no new features or changes can be added, solidifying the final scope for efficient completion.

* Applied to halt implementation of project a week before deadline to provide time allowance for report and powerpoint.

### Legal and Regulatory Risks

* **Data Privacy Compliance**

Ensure all user data handling complies with GDPR and other relevant data privacy laws.

* Included in Project Scope and Non-Functionality Requirements
* **Age Restrictions and Safety**

Consider age restrictions, ensuring that the product is safe and accessible for younger audiences. Additional laws regarding online safety and accessibility may also be reviewed.

# Project Plan for Next Phase

Despite this being the completion of AGA for the Final Year Project, there are still several features and improvements planned for future implementation. These ideas go beyond just the scope of this academic year and look toward a longer-term vision for AGA as a more complete and supportive tool.

Below are the planned future features for both the web app and the physical companion device, as well as long-term ideas that could continue to develop AGA into a smarter, more personalised assistant.

## Future Scope

Web App  
The *Focus Mode* feature is to be introduced on the web app to improve accessibility for users who prefer not to invest in the physical product. This version will offer the core functionalities of Focus Mode, however, due to limitations in resources and hardware access, the web version will have reduced capabilities compared to the physical device.

#### Other

* Dark theme mode
* Update About Us
  + Include more about name origin and creation of AGA

### AGA Bot

* **Weather Integration & AI Suggestions:** Real-time weather updates and AI-generated suggestions to help users prepare for the day based on weather conditions.
* **Wellbeing Tools:** Wellness exercises, activity tracking, and tailored wellbeing recommendations to support users’ mental and physical health.
* **Task Reminders System:** A smart reminder system that reads out the day’s tasks in the morning, provides midday check-ins for pending tasks, and shares a preview of the next day's tasks in the evening to support mental readiness.

## Long-Term Scope

* **Smart Eating & Reward System**

AGA includes gentle food and water reminders to support users who may forget to eat or stay hydrated regularly. These reminders encourage healthy habits by alerting users throughout the day.

To further promote consistency, a reward system acknowledges their efforts, helping build and reinforce sustainable routines around nutrition and self-care.

* **Routine Learning & Guidance**

Using machine learning, AGA observes and adapts to user behaviour over time. It can automatically set personalised reminders for repetitive daily tasks, such as taking medication, exercising, or other important activities.

By reducing the mental load of managing routines, AGA becomes a supportive guide that evolves with the user's lifestyle.

* **AGA Finder**

For users - especially those with ADHD - who frequently misplace items, AGA Finder allows the cube to alert a sound when prompted from the user's phone or web app.

This locator feature provides a quick, stress-free way to find the device, ensuring AGA remains within reach when needed most.

* **AR-Enabled Map Assistance**

AGA offers Augmented Reality-based navigation, where users can hold the cube and receive audio-guided directions like a GPS. This tool makes navigation intuitive and less overwhelming, offering reassurance - particularly helpful for users who may struggle with traditional map formats or sensory overload.

# Project Summary

Although this marks the completion of the project, it also represents the beginning of a broader vision for AGA. The work completed so far has laid a strong foundation, demonstrating the feasibility and potential of this companion device in supporting individuals who face difficulties with organisation, time management, and task prioritisation.

Throughout the development journey, I challenged myself by learning new technologies - using TypeScript and Tailwind CSS for the web application, and OpenCV, DLib, and Kivy, along with an object-oriented approach in Python, for coding the companion device. These choices not only enhanced the system’s functionality but also allowed me to expand my technical capabilities.

This year-long project offered key learning moments across various areas: from building both a responsive web application and a companion bot utilising a Raspberry Pi, to applying effective project management, conducting feasibility studies, and implementing system design principles.

More importantly, it deepened my understanding of ADHD and the significance of designing digital tools that prioritise mental wellbeing, accessibility, and user-centred support. It became clear that users facing mental health difficulties need more than generic productivity tools - they need systems that respond to their needs and create a sense of empowerment and control.

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# Appendix

## Testing Forms

|  |
| --- |
| ADHD and Daily Life Questionnaire |
|  |
| **Understanding ADHD and Daily Challenges** |
| In your own words, how would you describe ADHD and how it affects you personally? |
| What obstacles or challenges do you experience daily due to ADHD? |
| How do you typically overcome these obstacles or manage them? |
| **Current Tools and Resources** |
| What applications or activities do you currently use to help manage your daily routine? |
| What do you like most about the current services or tools you use? |
| What do you dislike about these services or tools? |
| **Desired Features** |
| What features are you looking for in apps or tools designed to support ADHD?   * Which features have been most helpful for you? * Which features have not worked or been effective for you? |
| **Proposed Solution** |
| Would you find a keychain device that consistently reminds you of your tasks and monitors your study/work progress helpful in managing ADHD? Why or why not? |

*Figure T1. Questionnaire Form*

*A screenshot of a computer

AI-generated content may be incorrect.*

*A screenshot of a computer error

AI-generated content may be incorrect.*

*Figure T2. UI & UX Form  
Note: Each section covered Creating an Account, Logging a Task and Mood, and Deactivation. The same questions were asked across sections.*