



# AGA

Advanced Guidance Assistance

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# 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

04<sup>th</sup> November 2024

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Lastly, a heartfelt thank you to my parents for their unwavering support and belief in me. Their unconditional love has raised me with the confidence to believe that nothing is impossible.

# Abstract

The Advanced Guidance Assistance (AGA) project is a dual-solution system designed to support individuals with ADHD in managing daily tasks, routines, and personal wellbeing. It combines a user-friendly web application with an interactive, portable companion bot to provide structured guidance, task reminders, and emotional support.

The web application, accessible across multiple devices - including laptops, smartphones, tablets, and PCs - offers a range of features such as a task organiser, calendar, weather integration with AI-generated suggestions, a mood tracker, and a personalised affirmation system tailored to the user's emotional state.

The companion bot, prototyped as a keychain device, enables users to engage with Focus Mode, monitor progress, receive break reminders, and stay informed of daily tasks through a more interactive experience. It also includes animated responses to foster a sense of connection and companionship.

Together, the web application and companion bot establish a strong foundation for AGA's initial development cycle, guided by a clear vision: to empower individuals with ADHD - or anyone facing challenges in organisation, task management, and prioritisation - by offering both practical support and wellbeing-focused features.

Future developments will incorporate wellness exercises, AI-driven suggestions, and machine learning to deliver a more adaptive and personalised experience. These enhancements aim to further improve the user experience (UX), solidifying AGA's role as a proactive, understanding, and intelligent assistant that supports not only productivity, but also emotional and mental wellbeing.

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## 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 a range of symptoms, including inattention, hyperactivity, and impulsivity. These symptoms can significantly affect various aspects of daily life, often making it difficult to stay organised, manage time effectively, or follow through with tasks. As a result, individuals may face challenges in maintaining personal relationships, performing well academically, or succeeding in a professional setting. Routine activities such as planning, prioritising, and remembering responsibilities can become overwhelming, leading to increased stress, frustration, and a decreased sense of productivity or self-esteem. These impacts highlight the importance of supportive tools and systems tailored to the unique needs of individuals with ADHD.

*"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 maintain focus on tasks or activities, with difficulties in concentration frequently resulting in incomplete or abandoned tasks. They may become easily distracted by external stimuli or internal thoughts, leading to a pattern of forgetfulness and disorganisation. Common challenges include misplacing or losing personal items, missing deadlines, and forgetting everyday responsibilities such as household chores, errands, bill payments, making phone calls, or attending scheduled appointments.

As noted by mental health professionals, *"...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.) These symptoms can have a cumulative effect on daily functioning and wellbeing, highlighting the need for practical tools and structured support to help manage these difficulties more effectively.

On the other hand, individuals with hyperactive-impulsive ADHD often exhibit restless behaviours, such as fidgeting, squirming, or tapping. In addition to physical restlessness, they may experience periods of hyperfocus—becoming intensely fixated on specific topics or activities for extended durations. While this can sometimes lead to high productivity in a narrow area, it often disrupts daily balance, causing the neglect of other important tasks, responsibilities, and personal needs. Over time, this pattern can lead to mental exhaustion and burnout, potentially affecting one's sense of self-worth and contributing to diminished 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, some individuals may experience a combination of both inattentive and hyperactive-impulsive ADHD, resulting in a blend of challenges from both types. This can make daily life even more complex, as they struggle with maintaining focus, managing impulsive behaviours, and regulating energy levels. ADHD can significantly disrupt an individual's ability to maintain a balanced lifestyle, which, over time, may impact their capacity to manage work or academic responsibilities, build and sustain self-confidence, and engage in hobbies or recreational activities. These ongoing difficulties can affect overall wellbeing and quality of life if not properly addressed with supportive strategies or tools.

### 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**

Establishing and maintaining a sense of organisation is one of the most effective ways to manage the daily challenges associated with ADHD. Preparing a detailed schedule each evening for the following day - and reviewing it each morning - helps build a clear awareness of responsibilities and upcoming tasks. This proactive approach gives individuals a greater sense of control and direction, reducing the likelihood of missed deadlines or overlooked responsibilities. It's also important to focus on one task at a time, as multitasking can often lead to reduced focus and increased stress. Incorporating effective time management strategies, such as allocating extra time for tasks and using timers or alarms, helps to keep activities on track while reducing pressure and anxiety around time constraints.

#### **Routine**

Consistent routines provide structure and predictability, which can significantly ease daily functioning for individuals with ADHD. When certain tasks become automatic through routine - such as morning preparations, meals, or end-of-day reviews - it frees up mental energy for more demanding activities. Establishing set times for household chores, supported by visual reminders or mobile notifications, can help reinforce habits over time. For example, setting a monthly alert to review and pay bills not only prevents last-minute panic but also builds financial awareness and responsibility. These repeated behaviours, once embedded, provide stability and reduce decision fatigue.

#### **Make Big Tasks Manageable**

Large, complex tasks can feel overwhelming and may lead to procrastination or avoidance. A helpful approach is to break these tasks down into smaller, more manageable steps. This technique allows for a clearer path forward, transforming an intimidating project into a series of achievable actions. Celebrating small wins at each stage can also boost motivation and a sense of accomplishment. Task prioritisation plays a vital role here: tackling the most challenging or important task first can create momentum for the rest of the day. This "eat the frog" strategy often leaves individuals feeling more accomplished and less burdened as the day progresses.

#### **Minimise Distractions**

Minimising distractions is crucial to maintaining focus and productivity. Individuals with ADHD may be particularly sensitive to visual and auditory stimuli, so creating a clutter-free, minimal environment can significantly improve concentration. This might involve organising workspaces, turning off unnecessary notifications, and setting specific time blocks for checking emails or messages. For some, tools like noise-cancelling headphones, site blockers, or dedicated work apps

can also help maintain attention and reduce the temptation to switch tasks prematurely. Establishing a dedicated, distraction-free space for different activities - whether work, relaxation, or exercise - can help reinforce mental boundaries and improve focus.

### Respect Your Limits

Recognising personal limits is a crucial part of managing ADHD effectively. It allows for more realistic planning, ensuring that daily goals are achievable without pushing beyond one's capacity. This approach reduces the likelihood of becoming overwhelmed and increases the sense of accomplishment when tasks are completed. By setting boundaries and acknowledging when rest is needed, individuals can avoid burnout and maintain a healthier pace.

Incorporating well-being activities into daily routines - such as short walks, stretching, breathing exercises, or physical activity - can help regulate energy levels and reduce stress. These moments of pause not only support mental clarity and emotional balance but also serve as a reset, allowing individuals to return to their tasks with renewed focus. Giving oneself permission to take breaks is essential; it is not a sign of weakness, but a necessary act of self-preservation and care.

These insights make it possible to clearly identify the core needs of individuals managing ADHD: structure, routine, manageable task planning, minimal distractions, and mindful self-care. By addressing these areas, individuals can foster a greater sense of control, build confidence, and establish a more balanced lifestyle.

Establishing structure and setting realistic, achievable goals lays the groundwork for a more positive and productive day. Maintaining routine helps reduce daily decision fatigue and stress, while recognising limits and prioritising self-care enhances overall wellbeing. When these elements are implemented together, they create a supportive environment in which individuals with ADHD can thrive - both personally and professionally.

### 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.

01	Focus Mode	High Priority
<b>Description</b> The concentration detection device monitors the user's focus in real time. When it senses a drop in attention, it sends a gentle alert to help the user re-engage with their task. Alternatively, if it detects prolonged intense focus, it recommends taking a short break to prevent mental fatigue. This balanced approach promotes sustained productivity and supports healthy work habits, especially for individuals who struggle with attention regulation, such as those with ADHD.	<b>Purpose</b> This feature is designed to promote a healthy balance between task completion and personal well-being by encouraging users to stay focused when distracted and to take mindful breaks during periods of intense concentration. It helps prevent burnout and supports sustained productivity throughout the day.	

### 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

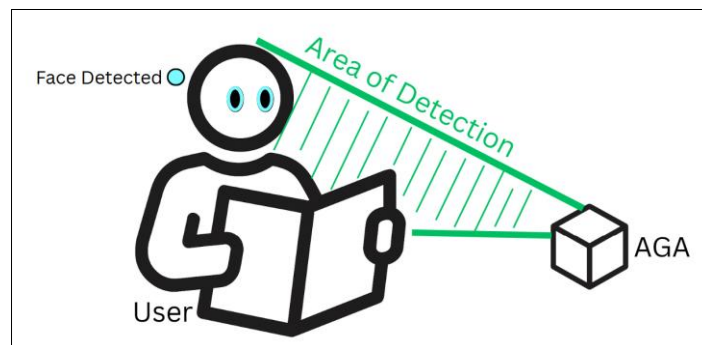


Figure 1a. Focus Mode Base Concept



Figure 1b. Loss Focus Concept

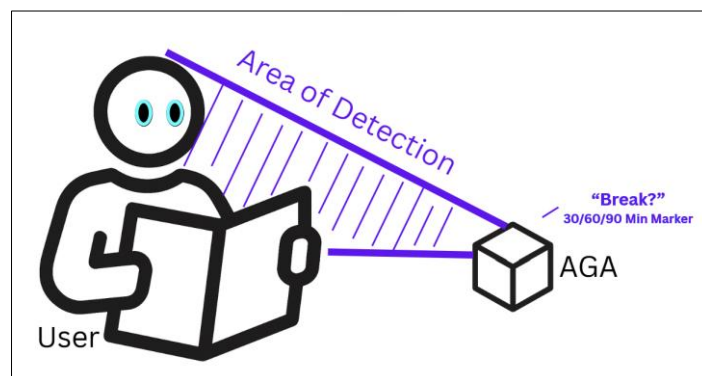


Figure 1c. Hyper Focus Concept

02	Task Setter	High Priority
<p><b>Description</b></p> <p>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.</p> <p>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.</p>		<p><b>Benefits</b></p> <p>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.</p>
<p><b>Functionality</b></p> <p>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.</p> <p>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.</p>		
<p><b>Concept Sketch</b></p> <div> </div> <p><i>Figure 2a. Task Setter Concept</i></p>		

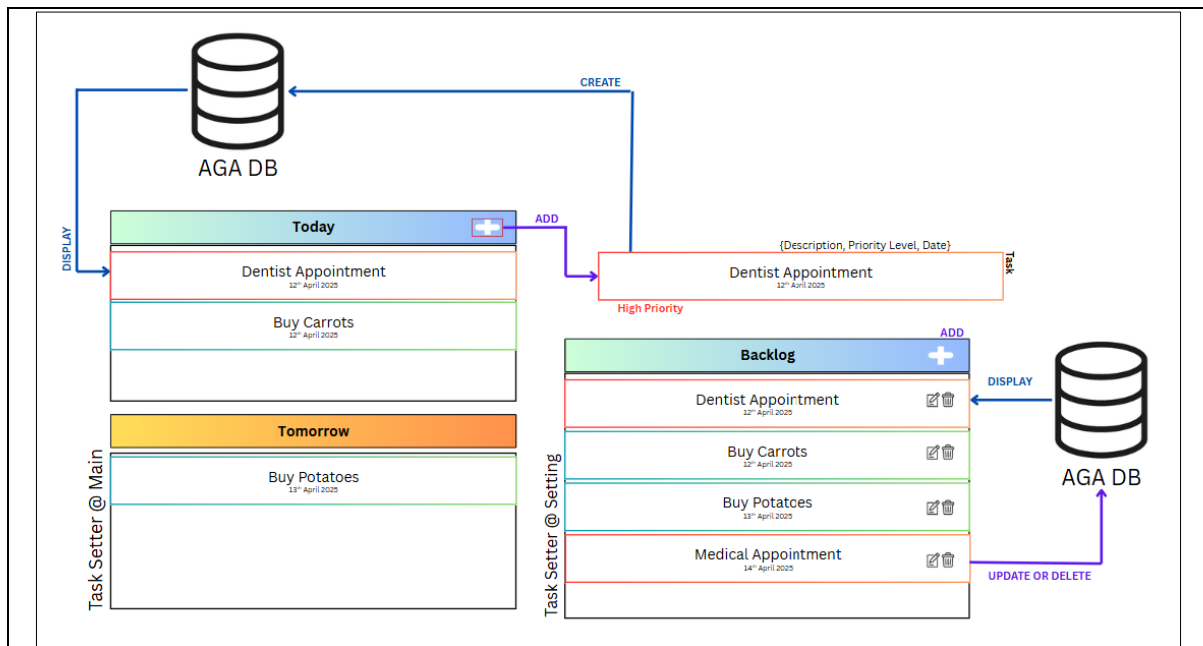


Figure 2b. Updated Task Setter Concept

03	Weather API	Mid Priority
<p><b>Description</b></p> <p>AGA continuously monitors real-time weather conditions and uses this information to deliver helpful, context-aware advice tailored to the individual's day. By integrating with OpenAI, AGA is able to generate personalised suggestions based on the current forecast—helping users plan ahead and make informed decisions about their daily routines. For example, on a rainy day, AGA might recommend carrying an umbrella, wearing waterproof clothing, or rescheduling outdoor activities.</p> <p>These prompts aim to reduce uncertainty, supporting users in feeling more prepared, comfortable, and confident as they navigate their day. This feature not only enhances practicality but also contributes to the user's overall wellbeing by promoting self-care habits aligned with environmental conditions.</p>		<p><b>Benefits</b></p> <p>This feature helps users prepare for their day more effectively by offering timely, weather-based suggestions, minimising disruptions caused by sudden or unexpected weather changes. It supports better planning and reduces the likelihood of being caught unprepared—such as forgetting an umbrella on a rainy day or dressing inappropriately for cold weather.</p> <p>This functionality is especially beneficial for individuals with ADHD, who may often overlook or forget to check routine details like the daily forecast. By providing automatic, context-aware reminders, AGA alleviates the cognitive load involved in daily planning and enhances the user's ability to stay on track, comfortable, and confident throughout their day.</p>
<p><b>Functionality</b></p> <p>The AGA web application retrieves real-time weather data through the OpenWeather API by requesting the user's current location. Once the weather conditions and temperature are obtained, this information is both displayed on the web interface and used to prompt OpenAI's language model (ChatGPT).</p> <p>The weather data - such as temperature, conditions, and time of day - is passed as a prompt to OpenAI, which then generates a personalised, context-aware suggestion. These smart prompts</p>		

might include advice like “It will rain today, don’t forget your umbrella!” or “It’s cold out - consider wearing an extra layer.” This AI-generated message is displayed directly on the web app, making it easy for users to receive practical, timely guidance.

By combining environmental data with AI-driven insight, AGA helps users make informed decisions with minimal mental effort. This is especially valuable for individuals who may struggle with planning or routine details - such as those with ADHD - offering them an added layer of support in staying prepared and confident throughout their day.

### Concept Sketch

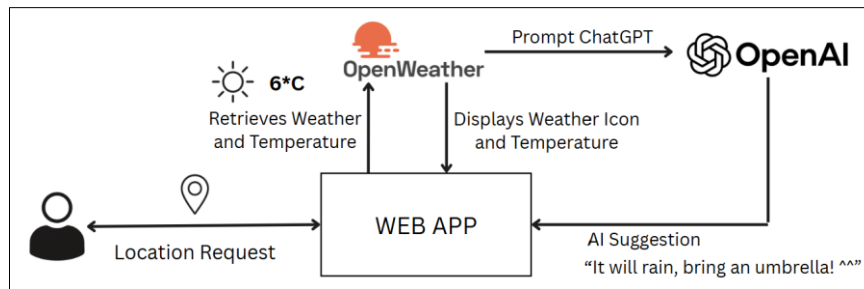


Figure 3a. Weather API Concept

04	Mood Log	Mid Priority
<b>Description</b> The mood tracker allows users to log their overall mood each day, creating a simple yet meaningful record of their emotional wellbeing over time. These daily entries are stored and analysed to provide visual insights and trends from the past four weeks. By reflecting on this data, users can better understand emotional patterns, and track improvements or changes in their mental health. This feature is designed to promote self-awareness and support individuals in recognising how their mood may relate to productivity, habits, and daily routines.		<b>Benefits</b> This feature provides users with a valuable overview of their mental well-being by visualising mood trends over time. It encourages self-reflection and supports a deeper understanding of personal emotional patterns, recurring moods, or periods of improvement. This tool helps with self-awareness and promotes healthier coping strategies by making mood tracking an accessible and meaningful part of their daily routine.
<b>Functionality</b> Individuals can log their mood multiple times throughout the day using the Mood Tracker. Each entry is stored in the database, and at the end of the day, the most frequently recorded mood - determined using the mode - is selected as the representative mood for that day.  This daily data is then visualised on a line graph that maps mood trends across the week, from Monday to Sunday. The graph features four distinct lines, each representing a different week of the month, allowing users to observe fluctuations and patterns over time. By reviewing these trends, individuals can gain insight into how their mood may be affected by daily routines, task loads, or external factors. This visual feedback supports greater self-awareness and can help users make informed decisions to improve their emotional wellbeing.		

*\*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

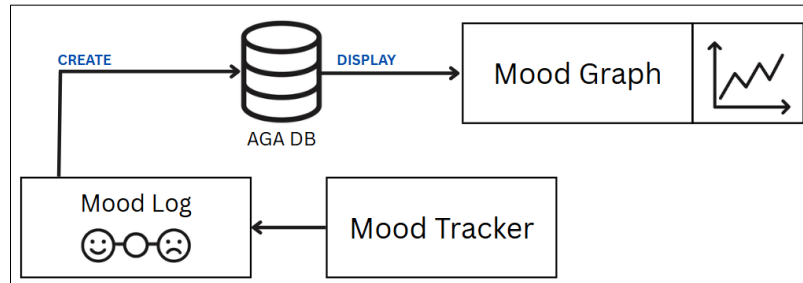


Figure 4. Mood Log Concept

05	Daily Affirmations	Low Priority
<div> <div> <b>Description</b> <p>The Daily Affirmation feature is designed to provide emotionally relevant and supportive messages, helping individuals begin their day with a sense of positivity, motivation, and encouragement. These affirmations are tailored to the user's current mood, offering gentle reinforcement that promotes self-worth, focus, and emotional resilience - especially beneficial for individuals managing stress and anxiety.</p> </div> <div> <b>Benefits</b> <p>This feature promotes mental well-being, which is a core area where individuals with ADHD often experience difficulties, such as low self-esteem, emotional sensitivity, or negative self-talk. Daily affirmations act as gentle reminders of personal value and progress, helping to build confidence and emotional resilience over time. By offering something positive to look forward to each day, the feature encourages a more optimistic mindset and supports the development of healthier emotional habits.</p> </div> </div>		
<b>Functionality</b> <p>This feature is integrated with the Mood Tracker and works by analysing the user's emotional data at the end of each day. It identifies the most frequently logged mood (the mode) and classifies it into one of three emotional categories: high, mid, or low. These categories reflect the general tone of the user's emotional state - ranging from positive and energised to neutral or low-mood states.</p> <p>Once the classification is made, the system automatically selects an appropriate affirmation from a curated JSON file containing a collection of prewritten messages tailored to each emotional range. The goal is to ensure that the affirmation displayed is not only motivational, but also emotionally relevant to how the user may be feeling.</p> <p>This process is entirely automated and requires no manual input from the user. The personalised affirmations are selected to offer emotional support, encouragement, and positivity. By aligning daily affirmations with the user's mood trends, this feature adds a personalised touch that promotes emotional resilience and supports mental well-being on a consistent basis.</p>		

## Concept Sketch

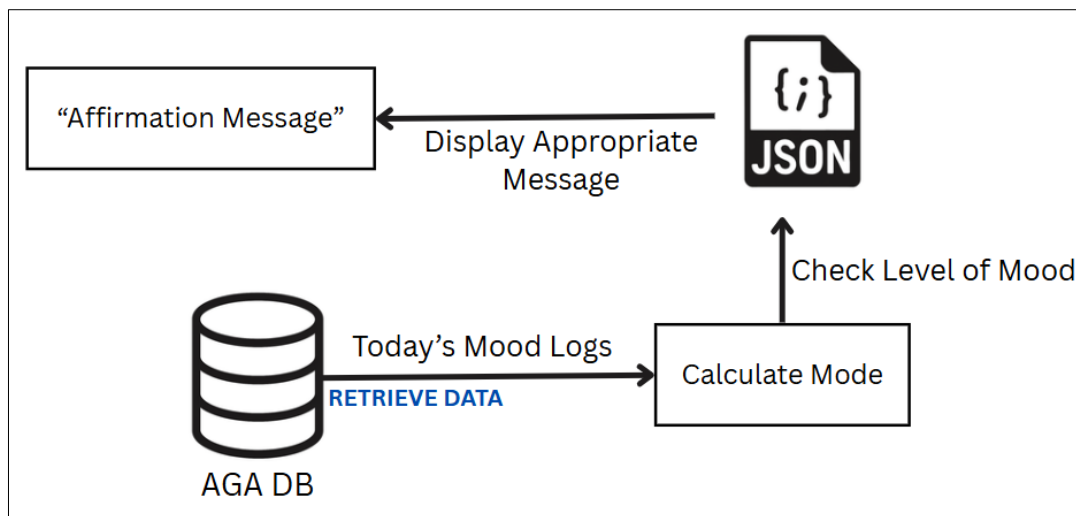


Figure 5. Daily Affirmations Concept

06	Well-Being Tools	Low Priority
<p><b>Description</b></p> <p>This tool is designed to support overall well-being by offering a suite of features that encourage mindfulness, balance, and healthy lifestyle habits. It includes mindfulness activities such as guided breathing and reflection sessions, an activity recommender to encourage mental stimulation and relaxation, and a balance system that helps users monitor how their time is divided between work and rest.</p> <p><b>Mindfulness Activities</b></p> <p>Users receive scheduled notifications prompting them to take brief pauses throughout the day to engage in calming activities such as breathing exercises or reflection time. AGA guides the user step-by-step - for example, by instructing them to “breathe in... and breathe out...” during breathing sessions - while providing gentle encouragement and positive reinforcement to create a calming, supportive experience. These moments of mindfulness help reduce stress, improve focus, and reinforce healthier emotional regulation.</p> <p><b>Activity Recommender</b></p> <p>This feature introduces users to new learning opportunities and recreational activities tailored to different moods or times of day. By encouraging users to try engaging, low-pressure activities - such as drawing, journaling, reading, or light exercise - the recommender promotes mental stimulation, stress relief, and emotional balance.</p> <p><b>Balance System</b></p> <p>The balance system monitors how much time the user spends on work-related tasks versus rest or recreational activities. If an imbalance is detected - such as prolonged periods of work without adequate rest - the system alerts the user and encourages them to take a break. By increasing awareness of time usage and lifestyle patterns, this feature helps users make more intentional choices and potentially uncover sources of stress or burnout. It supports the development of sustainable, healthy routines over time.</p>		



*\*\*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 mission of the Advanced Guidance Assistant (AGA) is to support individuals with ADHD in managing their daily tasks while fostering a more structured, balanced, and fulfilling lifestyle. ADHD can present a range of challenges, including difficulties with organisation, time management, concentration, and task prioritisation. These obstacles often make every day routines feel overwhelming and difficult to maintain consistently.

AGA is designed to address these challenges through personalised, practical assistance delivered in a user-friendly and engaging format. It provides structured support that helps users break tasks into manageable steps, build healthy routines, and stay focused throughout the day.

AGA is composed of two interconnected components: a responsive web application and an interactive physical companion device. Together, they offer tools and features such as mood tracking, smart reminders, Focus Mode, and emotional encouragement - tailored specifically to the needs of those navigating ADHD-related difficulties.

By integrating thoughtful design with evidence-informed strategies, AGA empowers individuals to take control of their daily lives, reduce stress, improve productivity, and enhance overall well-being.

### Name of Origin

The name “AGA” carries layered meanings that reflect both the emotional intent and the functional purpose behind the project. It is initially inspired by the word Agape, a Latin term meaning “unconditional love.” This choice symbolises the heart of the project - born out of a deep passion for improving mental health and emotional well-being. It represents the unconditional care, patience, and support that AGA aims to provide, particularly for individuals navigating the often-overlooked daily struggles associated with ADHD. This foundation of compassion was central to every stage of AGA’s development.

Additionally, the word “AGA” (아가) in Korean translates to “baby,” adding a softer, more nurturing element to the name. This interpretation contributes to AGA’s identity as a gentle, approachable, and supportive presence in the user’s life - like a quiet companion who is always there to guide, remind, and encourage without judgment. It humanises the system and makes it feel more like a personal ally than just another tool or app.

To offer the name a more functional identity that clearly communicates its purpose, the abbreviation Advanced Guidance Assistance was later developed. While the emotional meaning of AGA remains central, this expanded title provides clarity about what the system is designed to do: deliver structured, intelligent, and responsive support that helps users manage tasks, routines, and emotional well-being.

These meanings come together to shape AGA into more than just a productivity tool—it becomes a thoughtful, heart-to-heart support system, grounded in care, driven by purpose, and built to make a real-world impact.

### Mascot Design

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

symmetry, and balance. Its stable square base reflects strength and represents a solid foundation upon which users can build structure and routine in their daily lives.

This concept draws inspiration from Peter Cromwell's book *Polyhedra*, which explores the symbolic significance of geometric forms. As Cromwell stated in page 55, "The cube stands upright on a square base, expressing stability." (Cromwell, 1997)

The leaf on top adds a softer, organic touch to the design, symbolising growth, renewal, and the ongoing journey of self-improvement. It represents the personal development and emotional resilience that users cultivate as they interact with AGA over time.

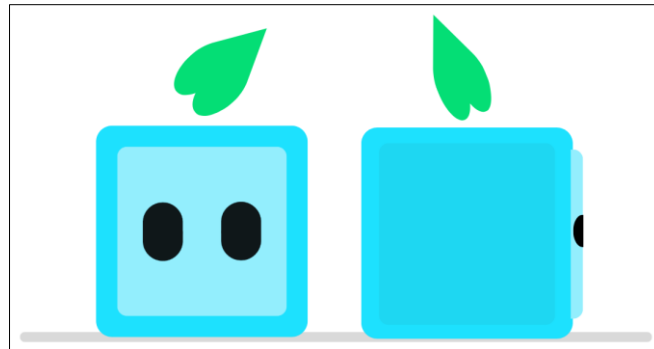


Figure 7. AGA Mascot

The design of AGA reflects its core mission: to help users cultivate stability and balance in their lives, ultimately strengthening their sense of self. The leaf on top of the cube serves as a symbol of growth, representing the personal journey of self-discovery, resilience, and continuous improvement that users embark upon with AGA by their side.

### 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.

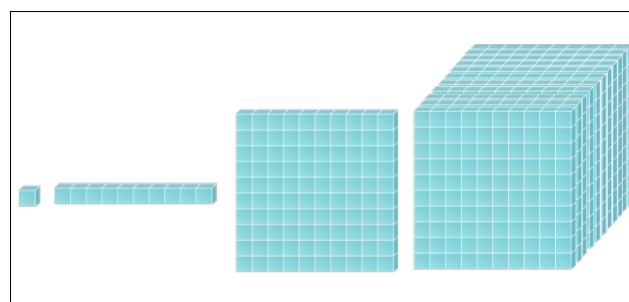


Figure 8. The Cycle of a Unit

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.

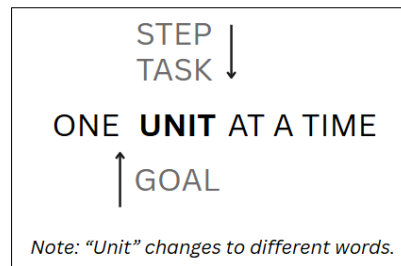


Figure 9. AGA's Slogan

### Colour Palette



Figure 10. Colour Palette Gradient

The chosen colour palette for AGA features a smooth gradient between blue and green, thoughtfully selected to embody the core values and emotional tone of the project.

Blue symbolises *calmness, clarity, and stability* - qualities that align closely with AGA's mission to offer emotional support, reduce overwhelm, and bring structure to the daily lives of individuals with ADHD. It reflects a sense of reassurance and mental ease, creating a visual atmosphere of peace and focus.

Green, on the other hand, *represents growth, renewal, and progress*. It captures the essence of self-improvement, encouraging users to develop healthier routines, build self-awareness, and move forward on their personal journey with confidence.

Together, the gradient between these two colours visually communicates a meaningful transition - from calm to growth. It mirrors AGA's goal of guiding users from a place of emotional strain and disorganisation toward one of balance, empowerment, and sustained well-being.

### Unique Selling Feature

The key selling feature of AGA is its minimalist approach, intentionally crafted to help individuals focus solely on today while providing a brief preview of tomorrow. This design encourages clarity and purposeful action by highlighting only immediate tasks, avoiding overwhelming users with extensive, long-term planning. By enabling prioritisation of daily responsibilities and providing a straightforward glimpse into the following day, AGA supports users in completing one task at a time with intention and confidence.

Complementing its minimalist philosophy, AGA includes a range of supportive tools such as calendar integration and real-time weather updates. Utilising OpenAI technology, it offers personalised suggestions tailored to daily weather conditions, guiding users on how best to prepare and organise their day. Additionally, the mood tracking feature delivers insights from emotional patterns recorded over the previous four weeks, empowering users to recognise trends and proactively manage their emotional well-being. Daily affirmations further enhance this supportive environment by reinforcing positivity and self-worth.

The Focus Mode feature exemplifies AGA's commitment to purposeful productivity, gently reminding users to stay concentrated on their current task or signalling the need for breaks when

signs of fatigue or overwork are detected. This approach ensures individuals maintain optimal productivity while safeguarding their mental health.

Beyond functionality, the physical presence of the AGA cube itself is a unique selling point. Strategically designed to remain within easy reach, this companion device provides tangible support for individuals struggling with disorganisation or task mismanagement. The device serves as a constant physical reminder, promoting structure, accountability, and ultimately improving users' lifestyles by helping them become better versions of themselves with its built-in features.

AGA's appeal is further reinforced through thoughtful design features and supplementary accessories available for purchase in a long-term vision, enhancing both aesthetics and usability. Its sleek, minimalist design blends seamlessly into various environments, from professional offices to home workspaces, promoting social engagement and fostering a sense of community among users. This integration of thoughtful physical design and digital innovation positions AGA not just as a productivity tool, but as a lifestyle enhancement, significantly enriching daily routines and overall quality of life.

## 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 Dr Bojan Božic, 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 core components are delivered through a physical cube device paired with a web application. The physical cube enables direct interactions with features such as Focus Mode, while the web application allows users to configure and manage Task Setters, including defining task details and assigning priorities for the cube.

The project scope of AGA includes the following components:

### Web Application

00	Website	High
<p><b>Scope</b></p> <p>This phase focuses on the design and development of a fully responsive website for AGA, which serves as the primary platform for delivering its web-based features. The goal is to create an intuitive, accessible, and visually engaging experience that enables users to interact with AGA's tools seamlessly across a variety of devices. Whether accessed via a laptop, mobile phone, or tablet, the website is designed to adapt to different screen sizes and resolutions, ensuring that functionality and usability remain consistent.</p> <p>Key features of the web platform include task management, mood tracking, personalised affirmations, weather-based suggestions, and in a future implementation, integration with Focus Mode. The website also acts as the main hub for setting up, managing, and customising interactions with the companion device.</p> <p>By prioritising responsive design principles and accessibility, the platform aims to accommodate the diverse needs and routines of individuals with ADHD. This cross-device compatibility ensures</p>		

that users can rely on AGA whether they're at home, at work, or on the go - making it a truly supportive and flexible companion.

### 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
    - i. Description
    - ii. Date
    - iii. 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.*

01	Account	High
<p><b>Scope</b></p> <p>This feature involves the implementation of a secure, minimal, and user-friendly account management system that enables users to create, access, update, and, if desired, delete their accounts with ease. The system is designed to prioritise simplicity and privacy, ensuring a smooth onboarding experience while maintaining the highest standards of data protection.</p> <p>In compliance with age restrictions and data privacy regulations such as the General Data Protection Regulation (GDPR), appropriate safeguards are built into the system. These include user consent mechanisms, and secure handling of personal information. Account deletion is made straightforward and irreversible, giving users full control over their data and digital footprint. This approach ensures that users can confidently engage with AGA's features, knowing their personal information is protected and that their interaction with the platform remains safe and transparent.</p> <p><u>The system must comply with age restrictions and data privacy regulations such as GDPR.</u></p> <p><b>Core Features</b></p> <ol style="list-style-type: none"> <li>1. <b>Account Creation (Sign Up)</b> <input type="checkbox"/> <ul style="list-style-type: none"> <li>○ Retrieve user registration information:               <ol style="list-style-type: none"> <li>i. Name</li> <li>ii. Email</li> <li>iii. Password</li> <li>iv. Date of Birth</li> </ol> </li> <li>○ Age verification (<i>Must be above 13 years of age.</i>)</li> <li>○ Successful sign up:               <ol style="list-style-type: none"> <li>i. Create a Firebase Auth User</li> <li>ii. Store user data in Firestore</li> </ol> </li> </ul> </li> <li>2. <b>Login</b> <input type="checkbox"/> <ul style="list-style-type: none"> <li>○ Users can log in with email and password</li> <li>○ Handle errors               <ol style="list-style-type: none"> <li>i. Wrong credentials</li> <li>ii. User not found</li> </ol> </li> </ul> </li> <li>3. <b>Password Reset</b> <input type="checkbox"/> <ul style="list-style-type: none"> <li>○ "Forgot Password" option</li> </ul> </li> </ol>		

<ul style="list-style-type: none"> <li>○ Allow users to enter email and receive a password reset link</li> </ul>
<b>4. <u>Settings Page</u> <input type="checkbox"/></b> <ul style="list-style-type: none"> <li>○ Display current user information</li> <li>○ Allow users to: <ul style="list-style-type: none"> <li>i. Edit name</li> <li>ii. Change password</li> <li>iii. Upload/change profile picture</li> <li>iv. Save changes</li> </ul> </li> </ul>
<b>5. <u>Account Deactivation/Deletion</u> <input type="checkbox"/></b> <ul style="list-style-type: none"> <li>○ Option to deactivate the account</li> <li>○ Ask for password confirmation before proceeding</li> </ul>
<b>Compliance &amp; Restrictions</b> <ul style="list-style-type: none"> <li>• Minimum age: 13 years (<i>Check DOB during signup</i>)</li> <li>• Data Minimisation (GDPR) <ul style="list-style-type: none"> <li>○ Only collect name, email, password, date of birth</li> </ul> </li> <li>• Secure password storage (<i>Encrypted by Firebase Auth</i>)</li> </ul>
<b>Technology Stack</b> <ul style="list-style-type: none"> <li>➔ <b>Frontend:</b> Next.js, TypeScript, Tailwind CSS</li> <li>➔ <b>Auth &amp; Backend:</b> Firebase Authentication</li> <li>➔ <b>Database:</b> Firebase Firestore</li> </ul>
<b>Future Improvements</b> <ul style="list-style-type: none"> <li>• Social Login (<i>Google, etc.</i>)</li> <li>• Include a “<i>Terms and Condition</i>”</li> </ul>

02	Task Setter	High
<b>Scope</b> The Main Task Manager is a simplified, user-focused feature designed to help individuals stay on top of their priorities without feeling overwhelmed. To maintain clarity and reduce cognitive load, the interface displays only today’s and tomorrow’s tasks, allowing users to focus on the immediate future rather than being distracted by long-term lists.  Users have the ability to add, edit, mark as complete, and delete tasks directly from this main view, ensuring quick and intuitive task management. For a broader overview, a separate Backlog view is available in the Settings section, where all tasks - past, upcoming, and unassigned - can be reviewed and managed.  This minimalistic approach supports individuals with ADHD or executive functioning challenges by reducing visual clutter, promoting focus, and encouraging steady daily progress without unnecessary stress.		
<b>Core Features</b>		
<b>1. <u>Main Page</u> <input type="checkbox"/></b> <ul style="list-style-type: none"> <li>○ Add task: Description, date, priority (Connect to DB)</li> <li>○ Complete task (Checkbox Tool)</li> <li>○ Display only today’s and tomorrow’s tasks <ul style="list-style-type: none"> <li>i. Scrollable to reduce number of tasks displayed</li> </ul> </li> </ul>		



ii. 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

03	Weather Tool	Mid
<b>Scope</b> 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.		
<b>Core Features</b>		
1. <u>Weather Display</u> <input type="checkbox"/>		
<ul style="list-style-type: none"><li>○ Retrieve current weather and temperature using OpenWeather API</li><li>○ Display weather icon and temperature that corresponds to weather data</li></ul>		
2. <u>AI Suggestions</u> <input type="checkbox"/>		
<ul style="list-style-type: none"><li>○ 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.")</li></ul>		
3. <u>Location Handling</u> <input type="checkbox"/>		
<ul style="list-style-type: none"><li>○ Ask user permission to access current location</li><li>○ Use location coordinates to fetch weather data</li><li>○ If permission is denied, provide an error message that is unable to retrieve weather and to enable location.</li></ul>		
<b>Restriction</b>		
➔ Must ask for location permission to retrieve weather (GDPR compliance)		
<b>Technology Stack</b>		
➔ <b>APIs:</b>		
<ul style="list-style-type: none"><li>○ OpenWeather API – real-time weather and temperature</li><li>○ OpenAI API – smart suggestions</li></ul>		

04	Mood Tracker	Mid
<b>Scope</b> The Mood Tracker records an individual's mood entries and displays them in a visual format to help identify emotional patterns and track how their feelings evolve over time.  The system presents this data in a clear, easy-to-read layout, making it more accessible and meaningful for users. In addition, the tracker delivers personalised affirmations based on the		

user's emotional range. These affirmations are designed to offer encouragement, promote emotional resilience, and support a more positive mindset.

This feature is particularly valuable for individuals managing emotional regulation challenges, as it provides a structured yet gentle approach to building emotional insight and self-awareness.

#### 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:
    - i. High – For Happy or above mood
    - ii. Mid – Okay Mood
    - iii. 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

05	Calendar Tool	Low
<b>Scope</b> The Minimal Calendar Widget is a simple, yet effective tool designed to enhance users' awareness of time and routine. It displays yesterday, today, and tomorrow, along with their corresponding dates and days of the week. Its streamlined design ensures users can quickly reference the current timeline without distraction.		
<b>Core Features</b> <ol style="list-style-type: none"> <li>1. <b>Display (Day, DD MM YY)</b> <input type="checkbox"/> <ul style="list-style-type: none"> <li>○ Yesterday's date and day</li> <li>○ Today's date and day</li> <li>○ Tomorrow's date and day</li> </ul> </li> <li>2. <b>Simple and clean UI</b> <input type="checkbox"/> <ul style="list-style-type: none"> <li>○ Larger font on Today's date</li> </ul> </li> </ol>		

## Bot Application

00	Bot Base	High
<p><b>Scope</b></p> <p>AGA, a companion bot, is a physical, screen-based device designed to support users in maintaining healthy work habits and improving their ability to focus. Serving as more than just a productivity tool, it offers an interactive and emotionally engaging experience that promotes balance and self-regulation throughout the day.</p> <p>Equipped with features such as animated facial expressions, time tracking, break reminders, facial detection, and passive interaction, the bot provides real-time feedback and gentle prompts that help users stay on task without feeling pressured. Its expressive animations create a sense of companionship, making it feel more like a supportive presence than a conventional productivity device.</p> <p>By blending function with emotional intelligence, the companion bot encourages mindful working patterns, helping individuals stay engaged, take necessary breaks, and build more sustainable routines.</p> <p><b>Bot Components</b></p> <ol style="list-style-type: none"> <li><b>Home</b> <input type="checkbox"/> <ul style="list-style-type: none"> <li>○ Clock</li> <li>○ Calendar</li> </ul> </li> <li><b>Main Page</b> <input type="checkbox"/> <ul style="list-style-type: none"> <li>○ Focus Mode</li> <li>○ Home</li> <li>○ Data Insights</li> </ul> </li> <li><b>Idle Animation</b> <input type="checkbox"/> <ul style="list-style-type: none"> <li>○ AGA animation/facial expressions</li> </ul> </li> <li><b>Interaction</b> <input type="checkbox"/> <ul style="list-style-type: none"> <li>○ Single Tap: Navigate through tools</li> <li>○ Double Tap: Interact with AGA (Bonus Animation) <ul style="list-style-type: none"> <li>▪ <i>Fun and emotional feedback interaction. Builds trust, and emotional connection with the user.</i></li> </ul> </li> </ul> </li> </ol> <p><b>Technology Stack</b></p> <ol style="list-style-type: none"> <li><b>Hardware</b> <ul style="list-style-type: none"> <li>○ <b>Raspberry Pi 4 Model B</b> – Acts as a small computer to run Python programs. Using a Rasp Pi came with a learning curve. <i>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.</i></li> <li>○ <b>Camera (HBVCAM-3M2111 V22)</b> – Face detection</li> <li>○ <b>Screen (Touch)</b> – AGA's Face Interaction</li> </ul> </li> <li><b>UI &amp; Animation:</b> Kivy + Custom Expression Assets</li> <li><b>Face Detection:</b> OpenCV and DLib</li> <li><b>Language:</b> Python</li> </ol> <p><b>Purpose</b></p> <ul style="list-style-type: none"> <li>➔ Encourage consistent focus and healthy break cycles</li> <li>➔ Improve awareness of time</li> <li>➔ Visualise progress and acknowledge effort</li> </ul>		

- ➔ 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.*

01	Focus Mode	High
<p><b>Scope</b></p> <p>Helps users maintain healthy work habits and improve focus by encouraging regular break intervals, preventing overwork, and reducing stress. By promoting a rhythm of work and rest, this feature supports a more balanced and sustainable approach to productivity - especially beneficial for individuals who tend to lose track of time or struggle with focus regulation.</p> <p>The system draws inspiration from well-established study methods, such as the <i>*Pomodoro Technique</i>, where users engage in focused work sessions followed by short breaks. After several cycles, a longer break is recommended to allow for deeper rest and recovery. This structured approach helps maintain mental clarity, avoid burnout, and improve task completion over time.</p> <p>By guiding users through these intervals and providing timely prompts for breaks, the system encourages mindful working patterns, boosts concentration, and supports long-term mental well-being. It not only improves daily productivity but also helps users build healthier routines that are easier to maintain consistently.</p> <p><b>Bot Components</b></p> <ol style="list-style-type: none"> <li>1. <b>Face Detection</b> <input type="checkbox"/> <ul style="list-style-type: none"> <li>○ Use OpenCV and DLib to check if user is within detection area and focused on task.</li> <li>○ Undetected: <ol style="list-style-type: none"> <li>i. After 30 seconds, a warning animation prompts.</li> <li>ii. If warning animation persists after 5 minutes with no user feedback/return to detection. System will exit focus mode and return Home.</li> </ol> </li> </ul> </li> <li>2. <b>Break Reminders</b> <input type="checkbox"/> <ul style="list-style-type: none"> <li>○ Track user's work hour progress</li> <li>○ Send break reminders every milestone marker (30/60/90): <ol style="list-style-type: none"> <li>i. 30 Minutes – 5-minute break (Suggestion)</li> <li>ii. 60 Minutes – 10-minute break (Suggestion)</li> <li>iii. 90 Minutes – 15-minute break (Forced)</li> </ol> </li> <li>○ After break, system prompts user to return to the task. If no action (5Mins), return home.</li> </ul> </li> <li>3. <b>Display</b> <input type="checkbox"/> <ul style="list-style-type: none"> <li>○ Base display is AGA's idle animation</li> <li>○ Every 10 seconds, session timer and time is show on screen.</li> </ul> </li> </ol> <p><b>Purpose</b></p>		

- ➔ 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.

**\*Pomodoro Technique:** *"Time management method developed by Francesco Cirillo in the late 1980s.[1] It uses a kitchen timer to break work into intervals, typically 25 minutes in length, separated by short breaks. Each interval is known as a pomodoro, from the Italian word for tomato, after the tomato-shaped kitchen timer that Cirillo used while a university student."* ('Pomodoro Technique', 2025)

*The technique has since been modernised, emphasising focused work sessions of 25 minutes, followed by a five-minute break. This method is effective because it promotes focus, minimises distractions, prevents burnout, enhances accountability, and boosts motivation. (The Pomodoro Technique — Why It Works & How to Do It, n.d.)*

02	Data Insights	Low
<p><b>Scope</b></p> <p>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.</p> <p><i>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.</i></p> <p><b>Core Features</b></p> <p>1. <b>Display</b> <input type="checkbox"/></p> <ul style="list-style-type: none"> <li>○ Yesterday's total work hours</li> <li>○ Today's work progress</li> <li>○ Return to Idle Animation after 30 seconds of inactivity</li> </ul>		

## Thesis Roadmap

### **Introduction and Project Background**

This section provides an in-depth study of ADHD, defining the condition, identifying its key challenges, and exploring the ways in which AGA can serve as a potential solution. The focus is on understanding the needs of individuals with ADHD, particularly in the context of task management, time management, and emotional regulation. By addressing these challenges, AGA aims to enhance the quality of life and support individuals in managing their daily routines more effectively.

### **Literature Review and Existing Solutions**

A comprehensive review of existing solutions and competitors will be conducted. This section analyses the strengths and limitations of these solutions, identifying areas where they succeed and areas that could be improved. A direct comparison will then be made between AGA and other products, highlighting AGA's unique features and how it stands out as a more integrated, user-friendly, and supportive tool for individuals with ADHD.#

### **Project Planning and Feasibility Analysis**

This section outlines the project management framework for AGA, detailing the planning process, timelines, and milestones. The feasibility of the project is also assessed, taking into account the technical, financial, and resource considerations required for successful implementation. Additionally, an analysis of the potential success of AGA will be conducted, evaluating its expected impact and usefulness for the target audience.

### **Design and Prototyping**

This stage focuses on the design of AGA, including the selection of the colour palette, UI design, and overall aesthetics. By creating wireframes, prototypes, and mockups, this section establishes the visual identity of AGA, ensuring the product is not only functional but also engaging and easy to use. The design phase will also consider accessibility, ensuring that AGA is intuitive

### **Testing and Evaluation**

Testing formats will be clearly defined to thoroughly evaluate AGA's functionality and effectiveness. This section includes user testing, feedback collection, performance assessment, and validation against initial project goals. A series of test cases and scenarios will be established to measure how well AGA meets user needs and how intuitive its features are for the target audience.

### **Refinement and Final Review**

This phase focuses on refining the code and enhancing AGA's performance based on feedback from testing. Adjustments will be made to improve the overall user experience (UX), ensuring that the final product is smooth, intuitive, and free of critical bugs or issues. This stage also involves ensuring that the system is optimised for performance, usability, and accessibility.

### **Documentation and Project Launch Preparation**

All final project documentation will be prepared, including the final report, user manual, and any other required deliverables. This section also includes preparation for the launch, ensuring that all necessary materials and support structures are in place for users to access and use AGA effectively.

### **Project Submission**

The final step involves the project overview report and presentation for submission, with all required components clearly outlined and compiled. This includes presenting the final deliverables and demonstrating how AGA meets its objectives, showcasing the work completed, and preparing for potential future development phases.

and user-friendly, particularly for individuals with ADHD.

### **System Architecture and Code Implementation**

This section provides guidance on the coding process and ensures structured implementation through use cases, requirements analysis, and system modelling. It defines the system architecture that underpins AGA, ensuring that the web application and companion device are integrated efficiently and work seamlessly together. The goal is to create a solid, scalable architecture that supports the project's long-term viability.

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.

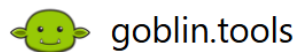
### Non-Technical Solutions

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](#)



*"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 users can 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](#)



*"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.

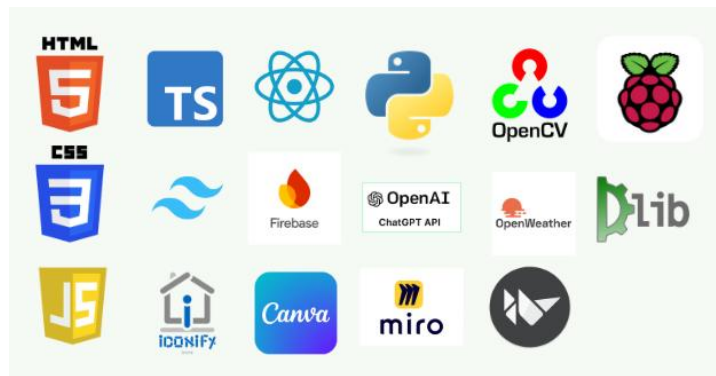


Figure 11: Tech Stack Overview

- ➔ **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))

<b>Author</b>	James Carswell C19749651
<b>Description</b>	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.
<b>Complexity of the Project</b>	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.
<b>Technical Architecture</b>	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.
<b>Strengths</b>	<ul style="list-style-type: none"><li>➤ <u>Real-time Productivity Tools</u> The ability to track tasks and visualise progress in real time boosts focus and productivity.</li><li>➤ <u>User Engagement</u> The personalised analytics and study tools cater well to university students, helping them maintain attention and build efficient work habits.</li></ul>
<b>Weaknesses</b>	<ul style="list-style-type: none"><li>• <u>Complexity in User Behaviour Tracking</u> Understanding user focus and behaviour can be challenging and may require further research and testing.</li><li>• <u>Potential Performance Bottlenecks</u> Real-time data processing and the need for frequent updates to the UI could create performance challenges, particularly as the user base grows.</li></ul>

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.

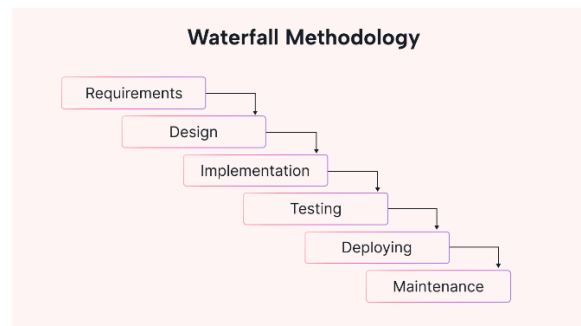


Figure 12. Waterfall Methodology

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.

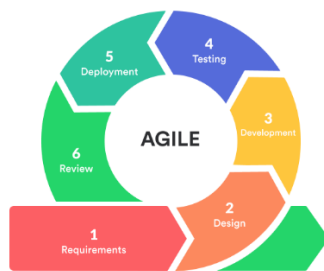


Figure 13. Agile Methodology

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.

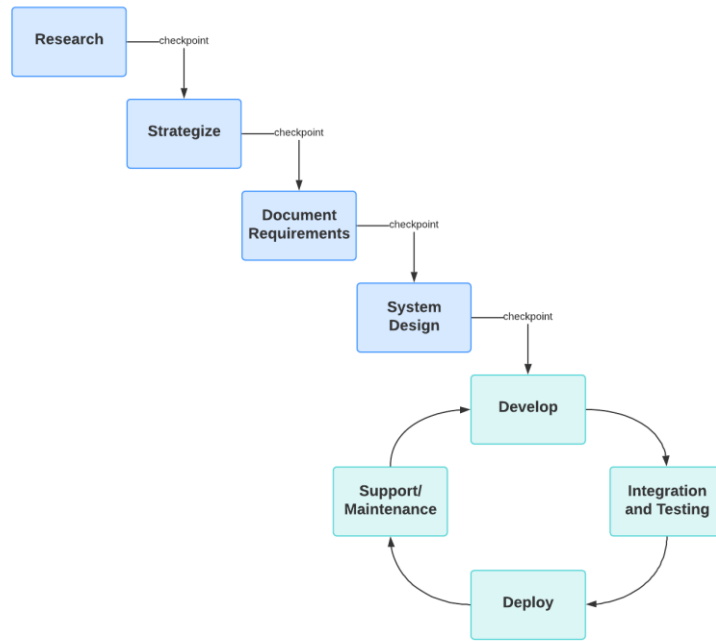


Figure 14. Hybrid Waterfall and Agile Methodology

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*.

<b>Frontend UI</b>	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.
<b>Backend Server</b>	Handles authentication (via Firebase Auth), processes user inputs, and manages feature functionalities.
<b>Database</b>	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

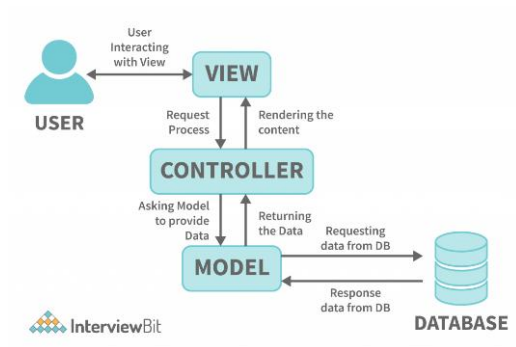


Figure 15. MVC Architecture

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.

<b>Model</b>	The database (Firebase) serves as the model, managing user data, task lists, preferences, and other information in real-time.
<b>View</b>	The user interface is built using Next.js framework, ensuring responsive interaction across devices.
<b>Controller</b>	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.

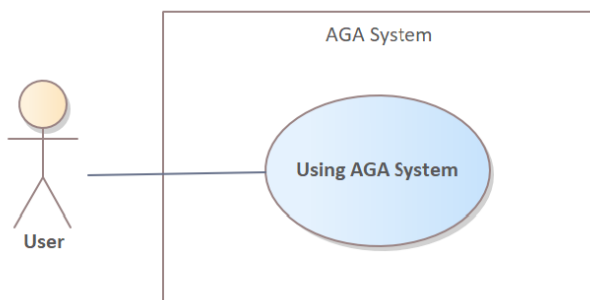


Figure UC1. Use Case 1 Using AGA System (UML2)

Use Case 1: Using AGA System	
<b>Goal</b>	User can use AGA's tools.
<b>Preconditions</b>	User requires a verified account.
<b>Postconditions (Success)</b>	User can access AGA's tools.
<b>Postconditions (Failed)</b>	User is unable to access AGA's tools due to unverified account.
<b>Actors</b>	Users (Individual with ADHD or Student)
<b>Trigger</b>	User wants to use AGA's system
<b>Description</b>	User logs/create an account to use the tools AGA offers.
<b>Priority</b>	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
<b>Exceptions or Error Flows</b>		
<b>Exception/Error Flow 1.2:</b> MF.1.2 User does not have an account		
1.1	User registers an account	MF.1.1
<b>Exception/Error Flow 1.3:</b> MF.1.3 User input incorrect user access details		
1.1	System prompts user of the error – <i>'Incorrect email or password'</i>	
1.2	User re-enters user access details	MF.1.3
<b>Non-Functional Requirement</b>		
<b>Adherence to Legal Principles</b>	Ensures compliance with data protection and privacy laws such as GDPR.	
<b>Regulation and Law</b>	Users should meet the standard age to access the website.	
<b>Data Minimisation</b>	Collects only the minimum necessary data for functionalities.	
<b>Purpose Limitation</b>	Uses data solely for its stated purpose with transparency to users.	
<b>Consent Management</b>	Requires explicit user consent before data collection or sharing.	
<b>Data Retention Policy</b>	Retains data only as long as necessary for its intended purpose.	
<b>Data Integrity</b>	Maintains data accuracy, completeness, and reliability.	
<b>Right to Erasure</b>	Ensures compliance with data protection and privacy laws such as GDPR.	

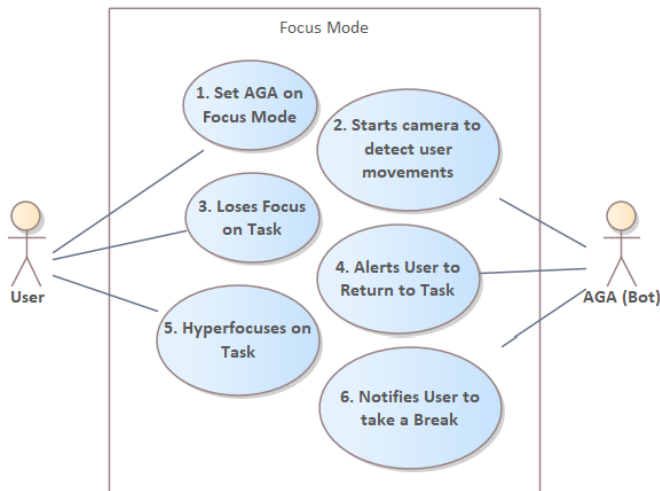


Figure UC2. Use Case 2 Focus Mode (UML2)

Use Case 2: Focus Mode	
<b>Goal</b>	User completes a task
<b>Preconditions</b>	AGA is set in front of User where their eyes are visible, and Focus Mode is enabled
<b>Postconditions (Success)</b>	AGA can detect User's concentration level and provide appropriate feedback
<b>Postconditions (Failed)</b>	AGA is unable to deliver its service due to system or hardware error
<b>Actors</b>	User, AGA Bot
<b>Trigger</b>	User wants to study/work therefore enabling Focus Mode
<b>Description</b>	User sets AGA on Focus Mode to start studying/working. AGA enables its camera to detect and alert user accordingly to complete task.
<b>Priority</b>	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
<b>Exceptions or Error Flows</b>		
<b>Exception/Error Flow 1.1:</b> 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
<b>Exception/Error Flow 1.3:</b> 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	
<b>Alternative Flows (AF)</b>		
<b>Alternative Flow 1.3:</b> AF.1.5 User loses focus on Task		
1.1	User takes a break	
1.2	User returns to task	MF.1.6
<b>Non-Functional Requirement</b>		
<b>Camera Security and Usability Restrictions</b>		Limits camera functionality to protect user safety and privacy.

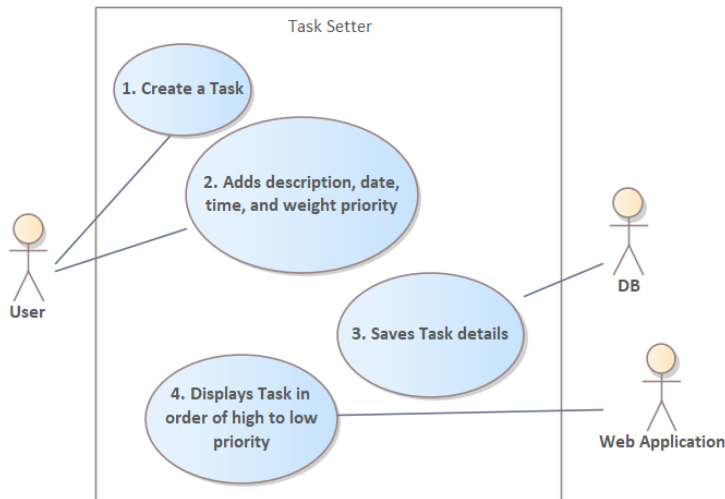


Figure UC3. Use Case 3 Task Setter (UML2)

Use Case 3: Task Setter	
<b>Goal</b>	User can add task and get a clear view of what to prioritise first
<b>Preconditions</b>	User is logged into account
<b>Postconditions (Success)</b>	Task is added onto scheduler ordered in high to low priority
<b>Postconditions (Failed)</b>	Task is not saved on scheduler
<b>Actors</b>	User, DB, Web Application
<b>Trigger</b>	User needs a reminder for a task
<b>Description</b>	User adds a task on scheduler, adding the description, date, time and priority weight.
<b>Priority</b>	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		
<b>Exception/Error Flow 1.2:</b> 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)		
<b>Alternative Flow 1.3:</b> 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		
<b>Data Minimisation</b>	Collects only the minimum necessary data for functionalities.	
<b>Purpose Limitation</b>	Uses data solely for its stated purpose with transparency to users.	

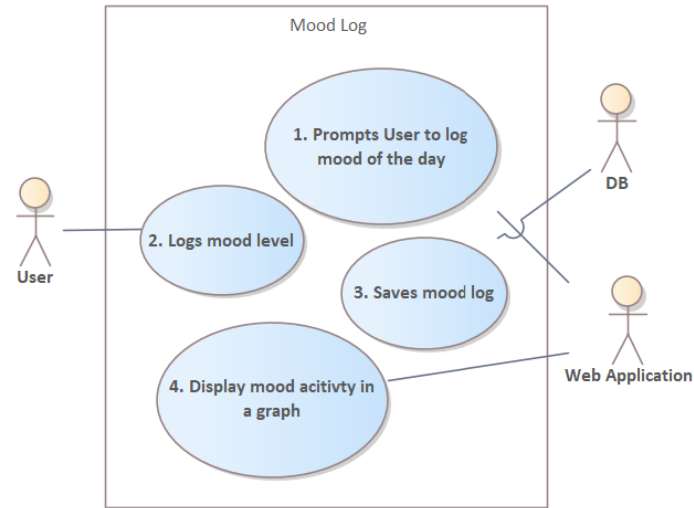


Figure UC4. Use Case 4 Mood Log (UML2)

Use Case 4: Mood Log	
<b>Goal</b>	Allow user to visually analyse the mental progression in a weekly or monthly basis.
<b>Preconditions</b>	User is logged into account
<b>Postconditions (Success)</b>	User logs mood activity and display logs into a visual graph
<b>Postconditions (Failed)</b>	Web App is unable to fetch logs from DB to produce a graph
<b>Actors</b>	Actor, DB, Web App
<b>Trigger</b>	User accesses account to check their mental progression
<b>Description</b>	User is prompted to log mood activity, and a graph is displayed of weekly or monthly logs
<b>Priority</b>	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		
<b>Exception/Error Flow 1.5:</b> 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)		
<b>Alternative Flow 1.2:</b>		
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		
<b>Data Minimisation</b>	Collects only the minimum necessary data for functionalities.	
<b>Purpose Limitation</b>	Uses data solely for its stated purpose with transparency to users.	
<b>Consent Management</b>	Requires explicit user consent before data collection or sharing.	
<b>Data Retention Policy</b>	Retains data only as long as necessary for its intended purpose.	

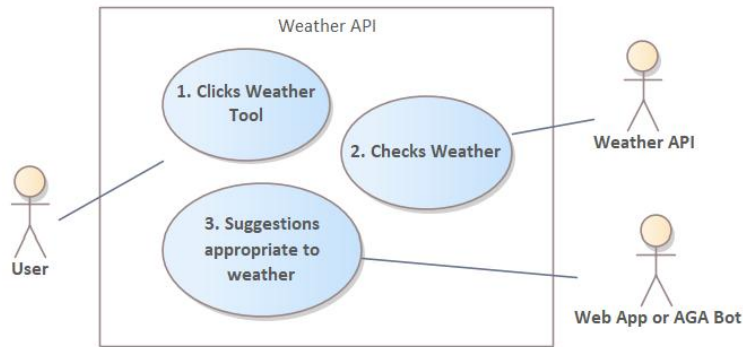


Figure UC5. Use Case 5 Weather API (UML2)

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

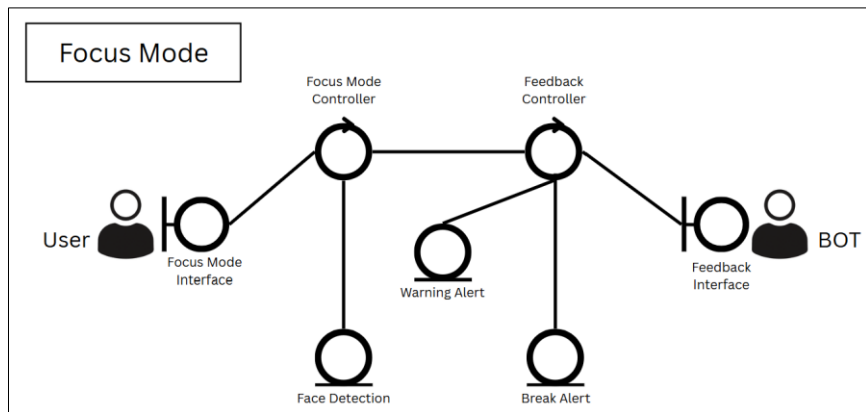


Figure CA1. Class Analysis Focus Mode

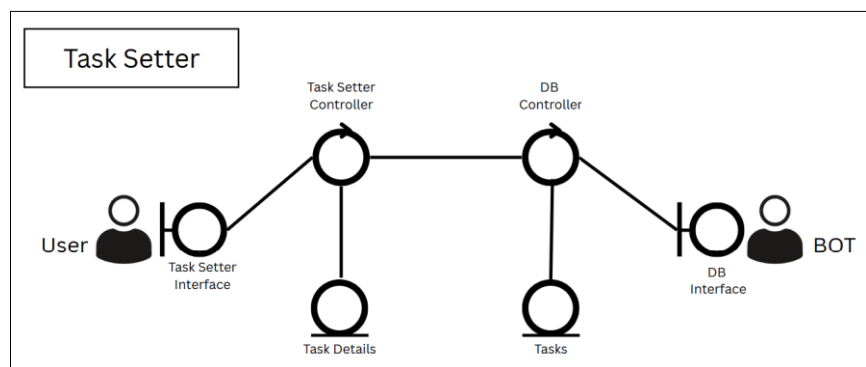


Figure CA2. Class Analysis Task Setter

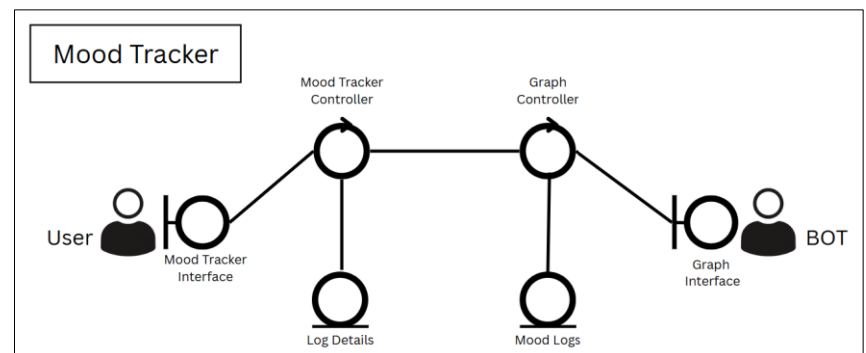


Figure CA3. Class Analysis Mood Log

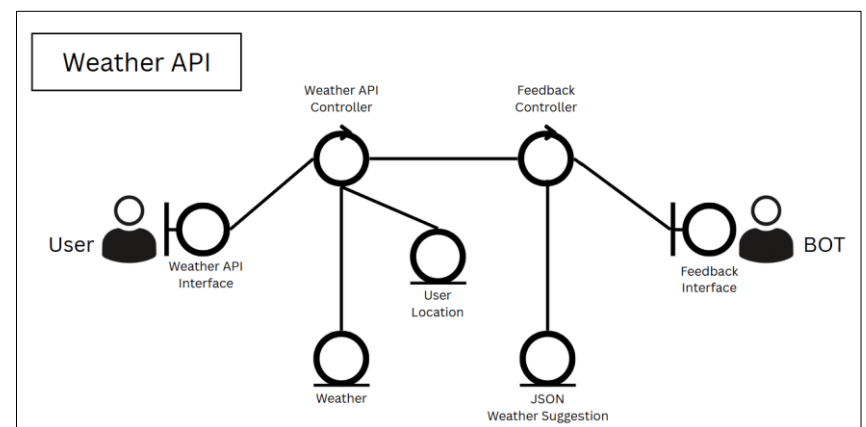


Figure CA4. Class Analysis Weather API

## Class and Sequence Diagram

### Focus Mode

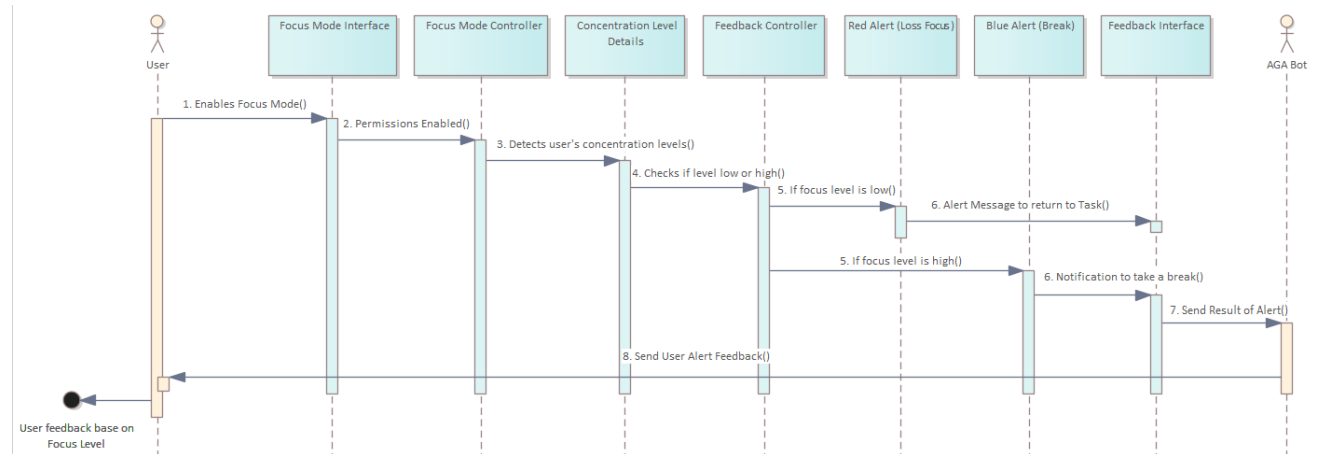


Figure SD1. Informal Sequence Diagram Focus Mode

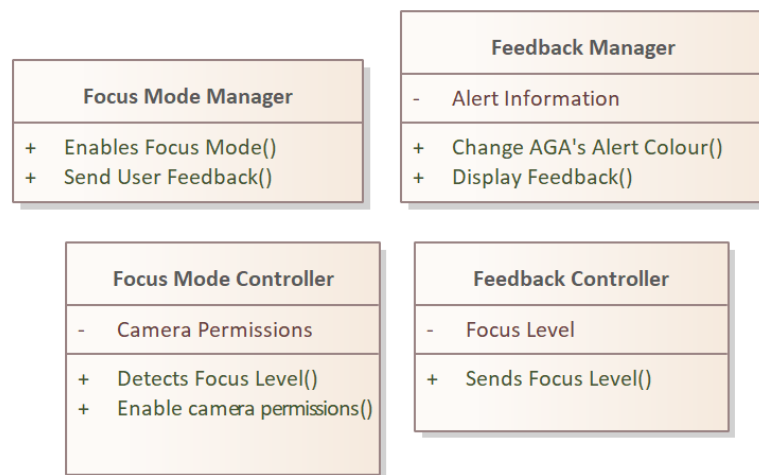


Figure CD1. Class Diagram Focus Mode

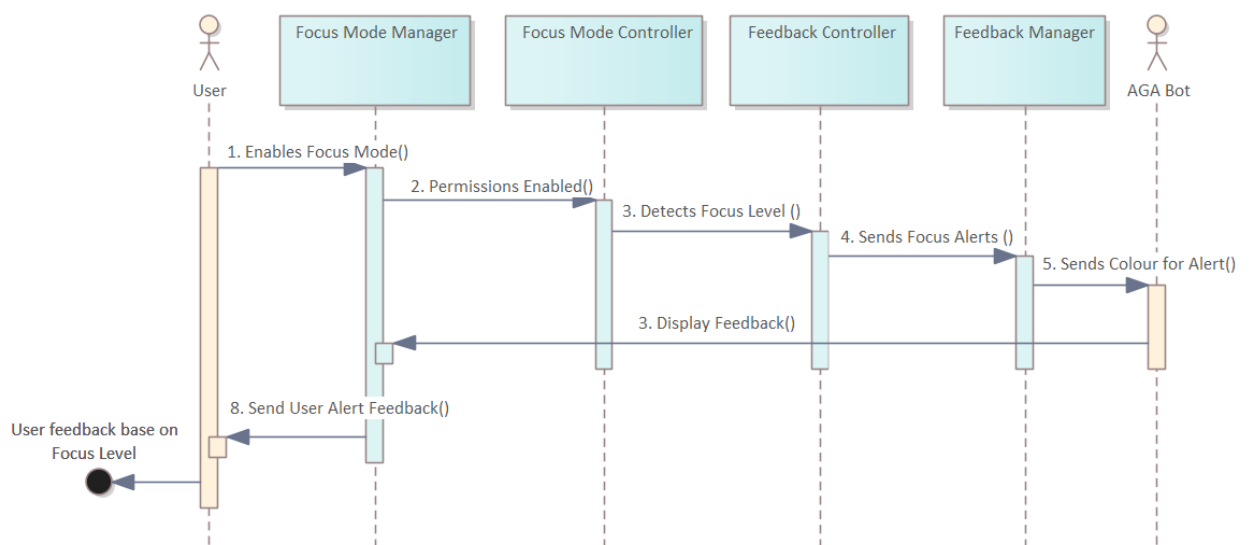


Figure SD2. Formal Sequence Diagram Focus Mode

## Task Setter

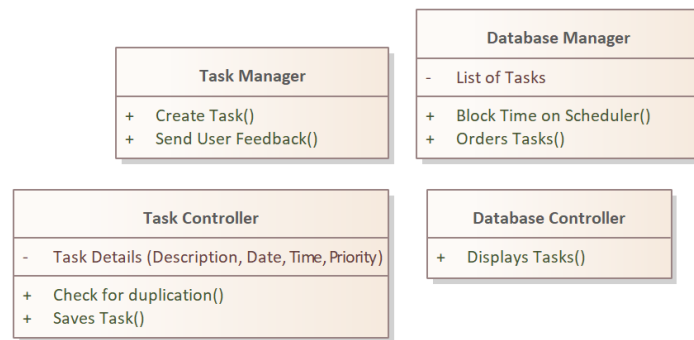


Figure A13. Class Diagram Task Setter

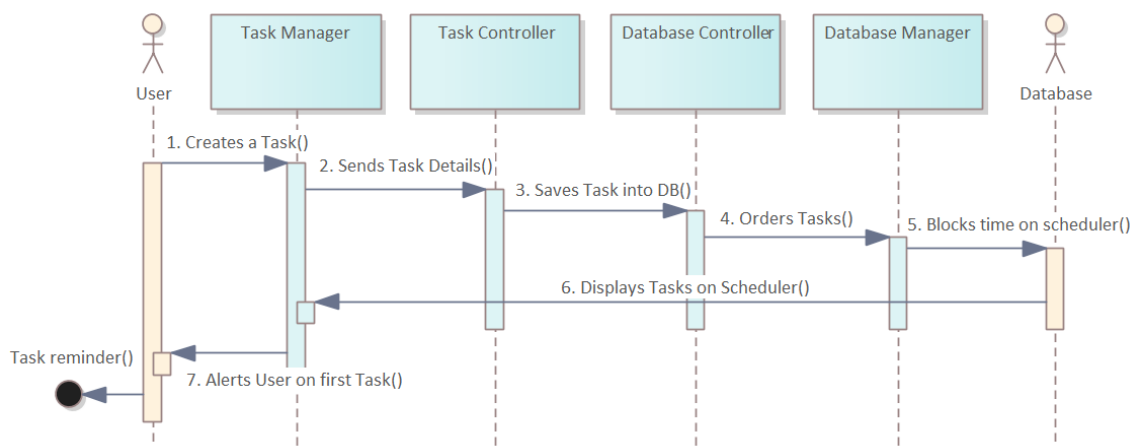


Figure SD3. Formal Sequence Diagram Task Setter

## Database Diagram (ERD)

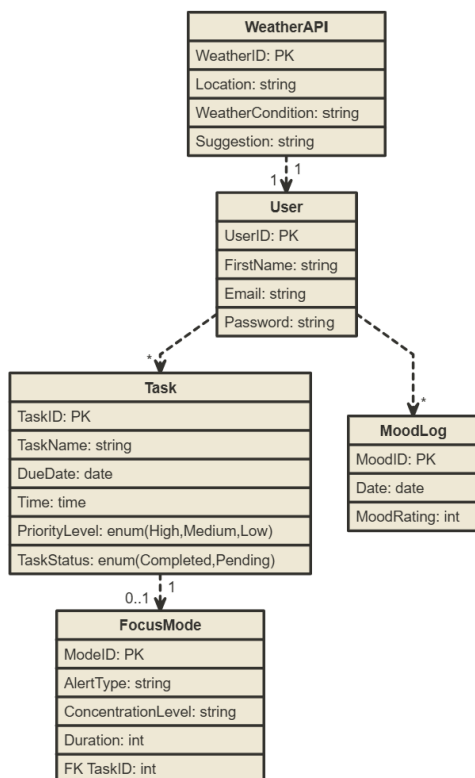


Figure ERD1. Entity Relation Diagram

### 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.

#### 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

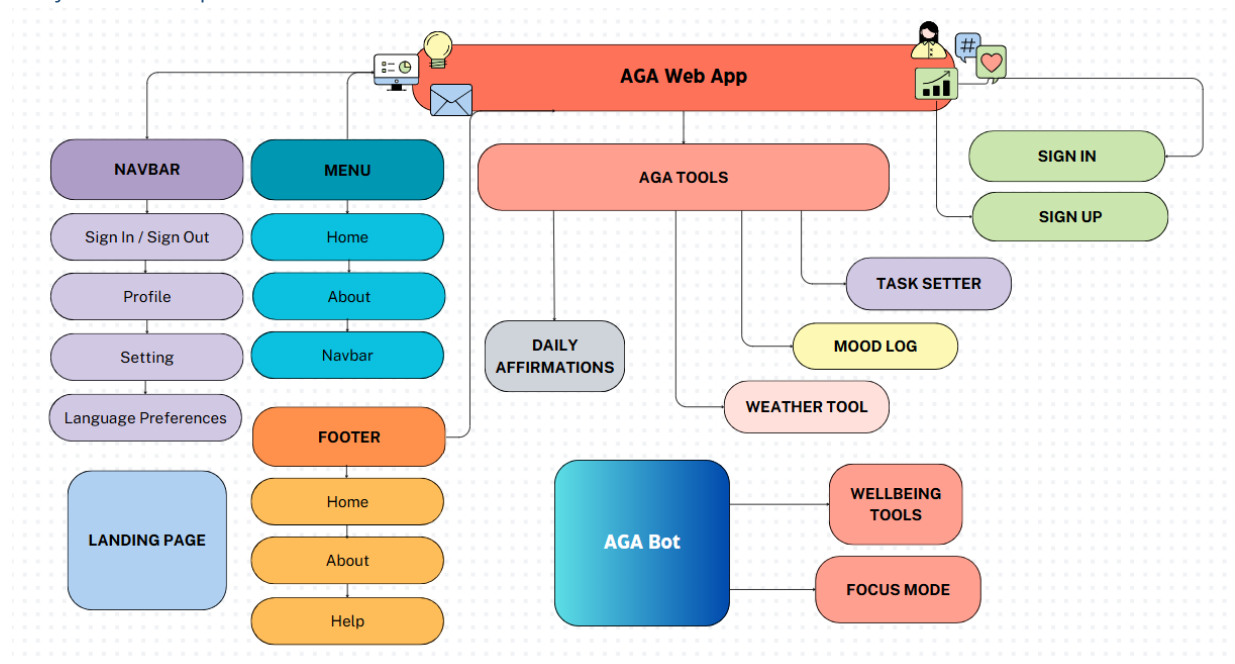


Figure 14. Sitemap

### Web App GUI Prototype

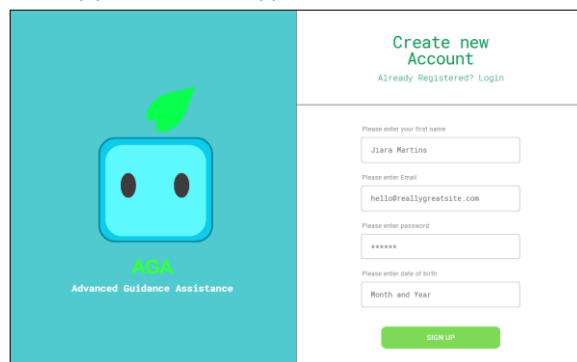


Figure B1. Web App GUI Sign In/Up

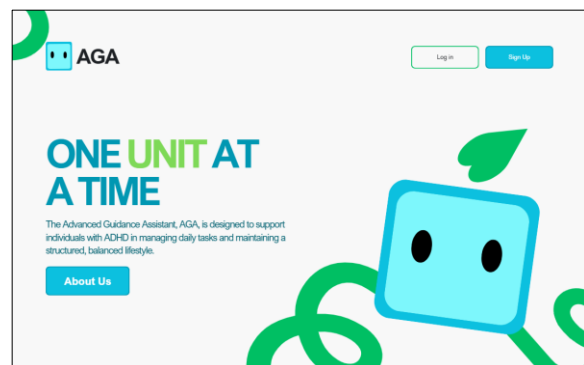


Figure B2. Web App GUI Landing Page

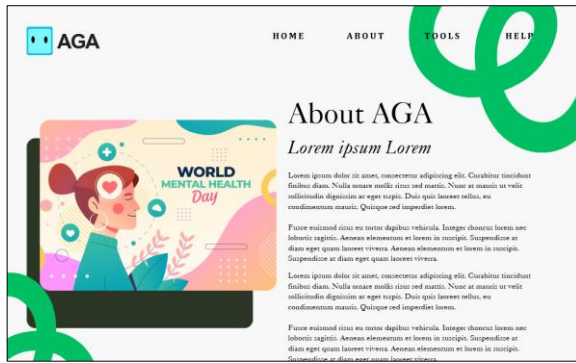


Figure B3. Web App GUI Landing Page: About

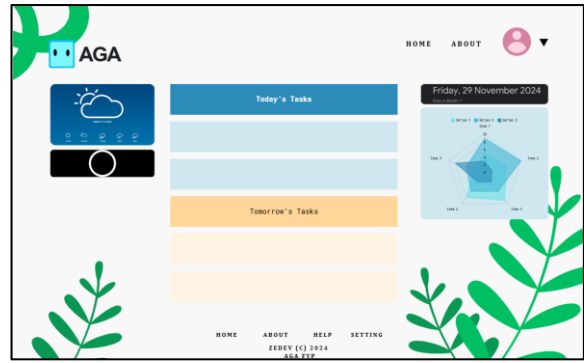


Figure B4. Web App GUI Main Page: Tools

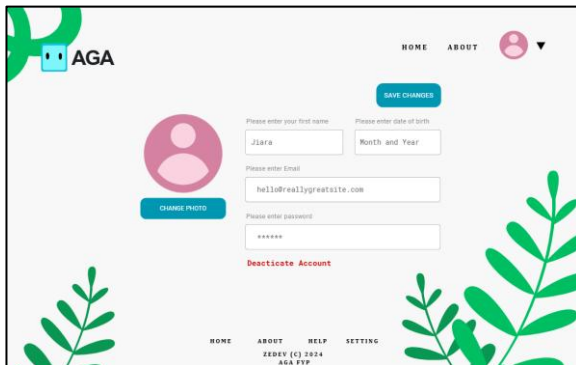


Figure B5. Web App GUI Profile/Setting Page

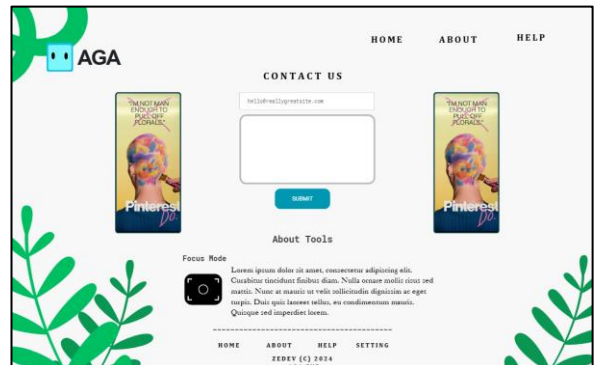


Figure B6. Web App GUI Contact Us Page

## AGA Bot GUI Prototype

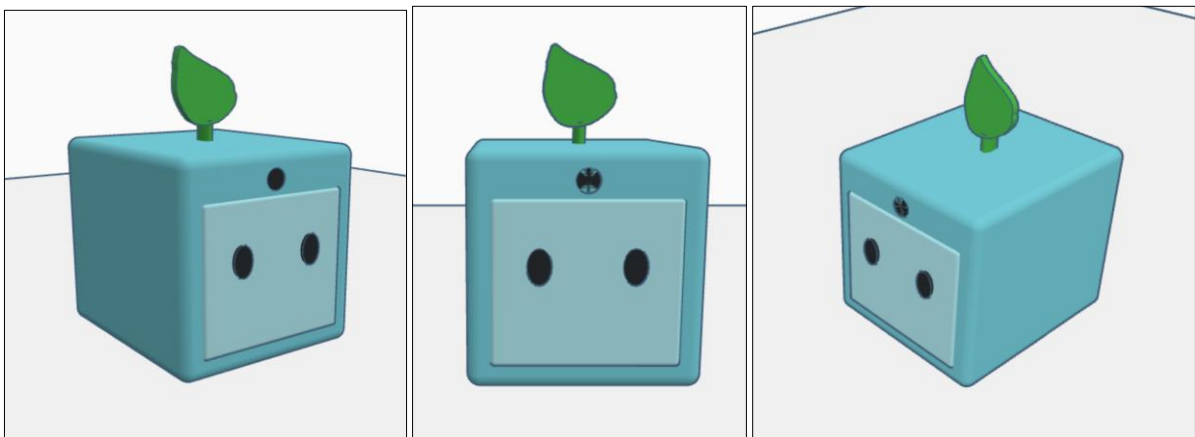


Figure C1. AGA Bot Using 3D Model

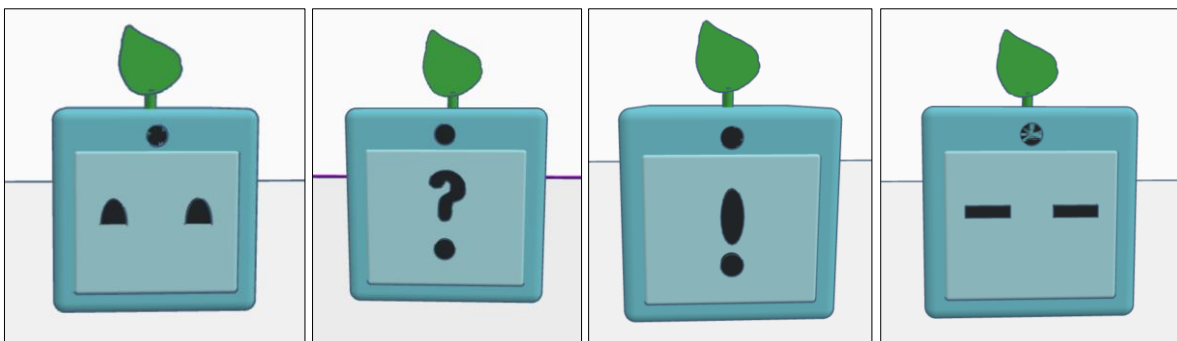


Figure C2. AGA Bot Expressions Using 3D Model



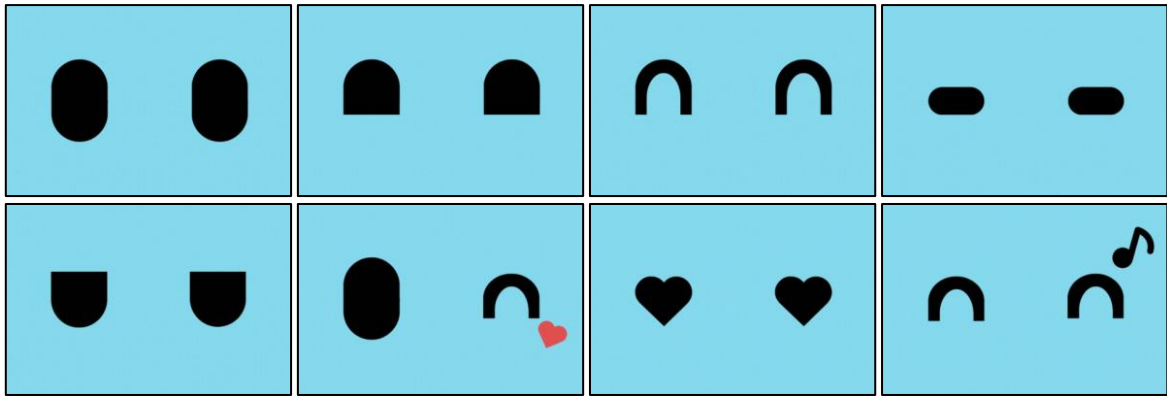


Figure C3. Updated Bot Expressions  
Neutral, Happy, Excited, Annoyed, Bored, Wink, Love and Bubbly expressions.

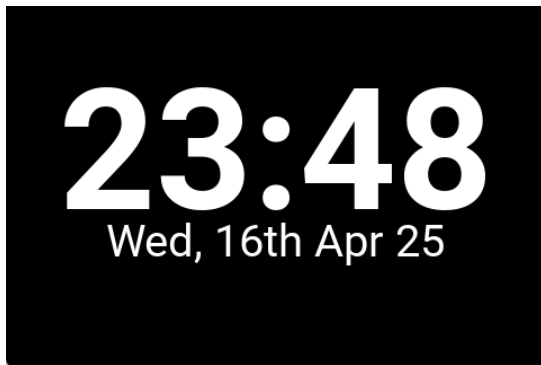


Figure C4. Home

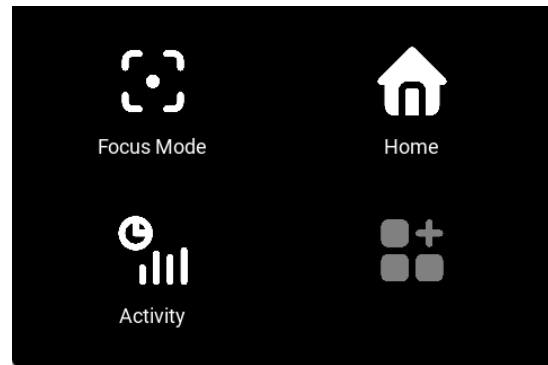


Figure C5. Main Menu

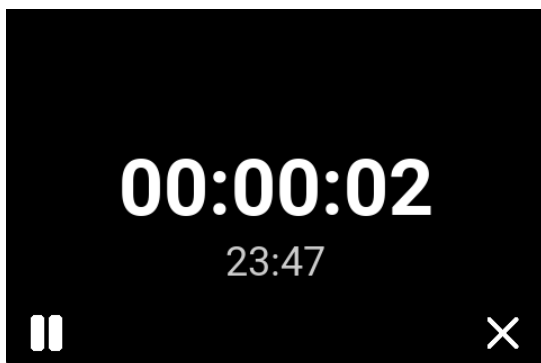


Figure C6. Focus Mode



Figure C7. Warning Message

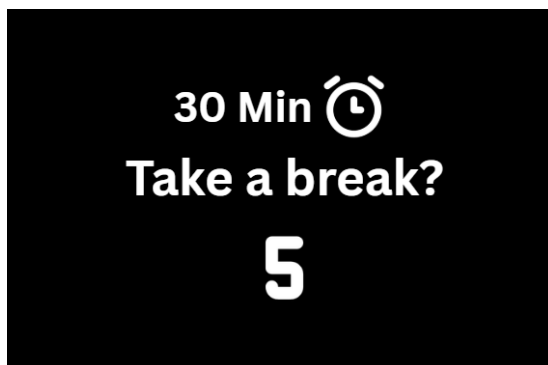


Figure C8. Break Message

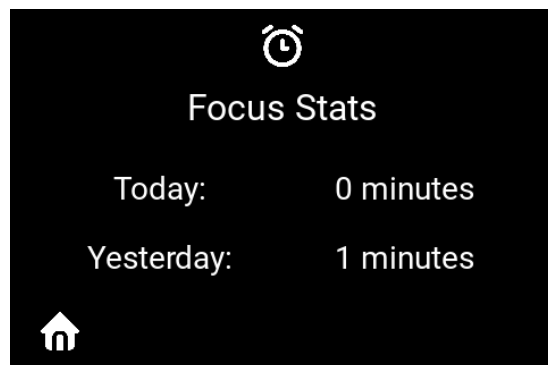


Figure C9. Data Analysis

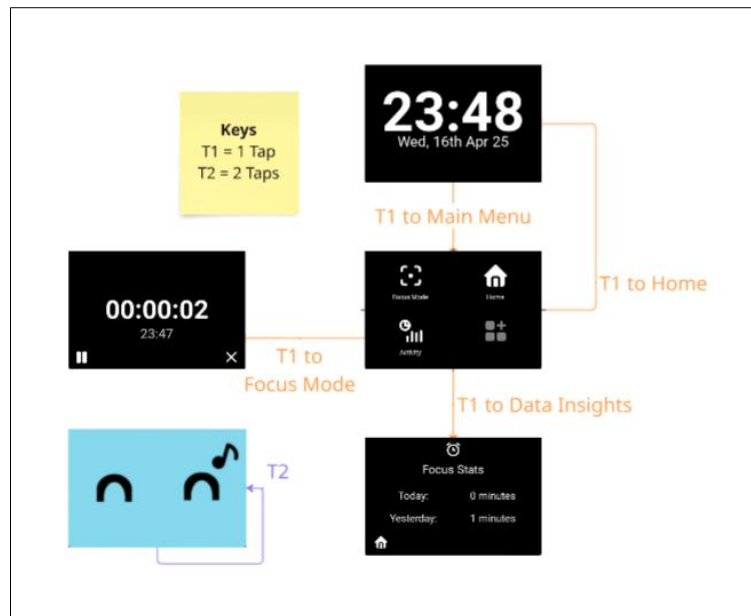


Figure C10. AGA's Base Navigation

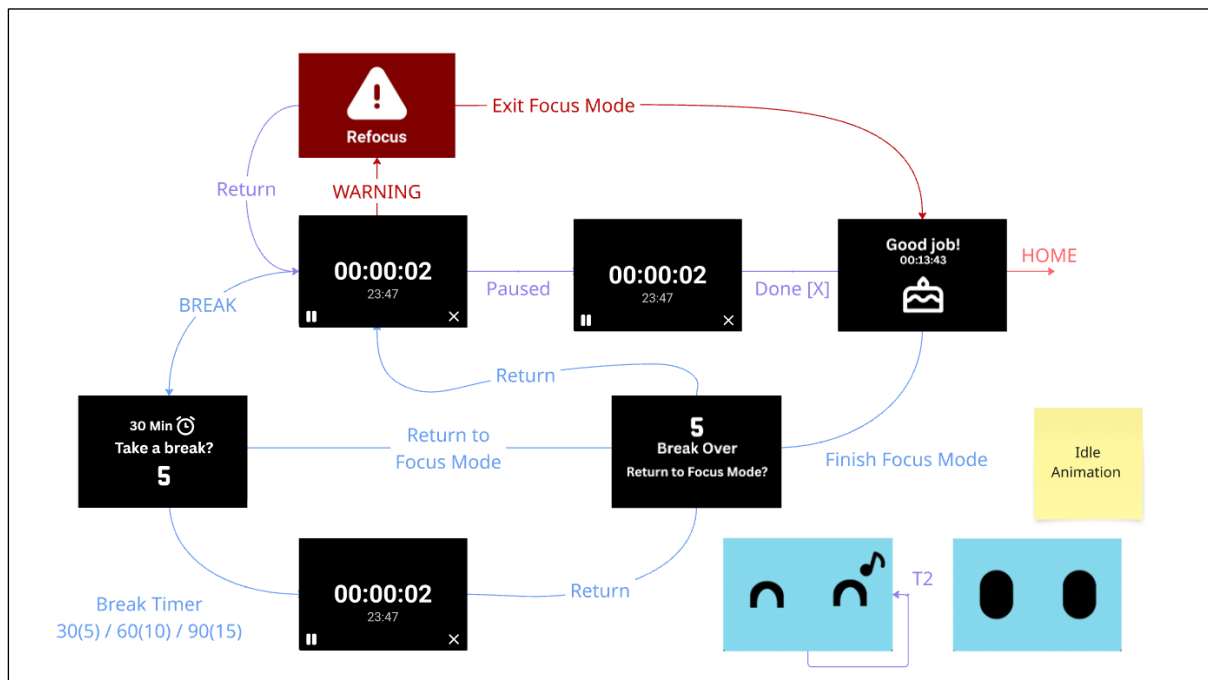


Figure C11. AGA's Focus Mode Functionality Map

## AGA Setup Manual

### Website Application

1. Git clone: <https://github.com/vedez/AGA/tree/main/aga-website>
2. Install and run the website locally:
  - i. `cd aga-website`
  - ii. `npm install`
  - iii. Edit .env file for Firebase credentials with own.
  - iv. `npm run dev`
3. Or, you may run the hosted website: <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
  - i. Sudo apt update
  - ii. Sudo apt upgrade
4. Install drivers for LCD screen
  - i. git clone <https://github.com/waveshare/LCD-show.git>
  - ii. cd LCD-show/
  - iii. chmod +x LCD35B-show
  - iv. ./LCD35B-show
5. Pi will reboot and screen should work

### Install AGA

1. Git clone: <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
<b>Understanding ADHD and Daily Challenges</b>
In your own words, how would you describe ADHD and how it affects you personally? <ol style="list-style-type: none"><li>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.</li><li>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.</li><li>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.</li><li>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.</li></ol>
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 autcreate 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.
3. GDT, Freedom App, Kanbans, calenders, whiteboards, and lots of excercise.
4. 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?

<ol style="list-style-type: none"> <li>1. In terms of reminders on my phone I like that it'll notify me at that time and is pretty simple.</li> <li>2. N/A</li> <li>3. N/A</li> <li>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.</li> </ol>
<p>What do you dislike about these services or tools?</p> <ol style="list-style-type: none"> <li>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.</li> <li>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.</li> <li>3. They don't really work all the time, and I have to pay for them.</li> <li>4. It requires so much effort to set up which then demotivates me as Ive already invested so much mental strength preparing it.</li> </ol>
<p><b>Desired Features</b></p> <p>What features are you looking for in apps or tools designed to support ADHD?  <i>Which features have been most helpful for you? Which features have not worked or been effective for you?</i></p> <ol style="list-style-type: none"> <li>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.</li> <li>2. I love having widgets that I am forced to see when I scroll past them.</li> <li>3. Freedom because it locks me out of distractions. It doesn't 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.</li> <li>4. I want a product that is hard to miss, forget. Maybe a reward system? Something that will help my inconsistency.</li> </ol>
<p><b>Proposed Solution</b></p> <p>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?</p> <ol style="list-style-type: none"> <li>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.</li> <li>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.</li> <li>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.</li> </ol>

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.

<p><b>Understanding ADHD and Daily Challenges</b></p>	<p><b>ADHD Characteristics</b> 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 "<i>changing puzzle</i>" capture the internal struggle, reflecting the unpredictability of focus and motivation experienced by those with ADHD.</p> <p><b>Common Challenges</b> 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 paralyzing, causing individuals to focus on less important tasks while neglecting those that are more urgent.</p> <p><b>Methods of Coping</b> 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.</p>
<p><b>Current Tools and Resources</b></p>	<p>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 <i>Freedom</i> to block distractions and <i>Waterllama</i> to encourage hydration.</p> <p><b>Positive Notes</b></p> <ul style="list-style-type: none"> <li>▪ Simple notifications and reminders were seen as effective for staying on top of tasks.</li> <li>▪ Repetitive or consistent alerts are useful. <ul style="list-style-type: none"> <li>○ 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.</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>Integration across multiple devices, such as phones and laptops, made tools easier to use. <ul style="list-style-type: none"> <li>A web application was chosen to ensure that features are easily accessible across a wide range of devices.</li> </ul> </li> </ul> <p><b>Negative Notes</b></p> <ul style="list-style-type: none"> <li>Discouragement on tools that require significant effort to set up.</li> <li>Notifications and reminders often become repetitive or easy to ignore over time, reducing impact. <ul style="list-style-type: none"> <li>AGA's facial expressions and interactive UI help make reminders fun and something users can look forward to.</li> </ul> </li> <li>Some apps require subscriptions or payments, which can be off-putting.</li> </ul>
<b>Desired Features</b>	<p><b>What Users Wants:</b></p> <ul style="list-style-type: none"> <li>➔ <b>High visibility</b> Features such as widgets or unavoidable reminders to increase accountability.</li> <li>➔ <b>Customisation</b> The ability to personalise apps, such as adding personal icons, images, or themes, to make them more appealing.</li> <li>➔ <b>Physical presence</b> A product that is hard to forget or miss, such as a device always in sight, to ensure consistency.</li> <li>➔ <b>Reward systems</b> Features that encourage progress by offering small, tangible incentives.</li> </ul> <p><b>Avoid:</b></p> <ul style="list-style-type: none"> <li>Overly complex setups that require significant effort to maintain.</li> <li>Tools or apps that don't adapt to a user's forgetfulness or inconsistency.</li> <li>Standard notifications or alerts that become repetitive and blend into the background.</li> </ul>
<b>Proposed Solution (Keychain Device (AGA Bot))</b>	<p>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.</p> <p><b>Suggested Solution:</b></p> <ul style="list-style-type: none"> <li>Some suggested that such a device would only work if it has a way to avoid being ignored.</li> <li>Suggestions included creating a highly visible, non-intrusive alternative that would encourage consistent use without overwhelming the user.</li> </ul>

## 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	<input checked="" type="checkbox"/>
CRUD: Edit and Delete task from Settings page	<input checked="" type="checkbox"/>
Task Data in DB should include Description, Date, and DOB	<input checked="" type="checkbox"/>
Tasks are ordered by priority	<input checked="" type="checkbox"/>
Main page shows only today's and tomorrow's tasks	<input checked="" type="checkbox"/>
Backlog shows all tasks regardless of date	<input checked="" type="checkbox"/>

Weather Tool	Done
Location permission prompts correctly when not enabled	<input checked="" type="checkbox"/>
OpenWeather API retrieves weather based on user's location	<input checked="" type="checkbox"/>
Displays correct city and country name (Ensure Location is correct)	<input checked="" type="checkbox"/>
Displays appropriate weather icon and temperature	<input checked="" type="checkbox"/>
OpenAI provides preparation suggestions based on weather ( <i>Note: Restriction applied on frequency of prompts to reduce cost of usage</i> )	<input checked="" type="checkbox"/>

Calendar	Done
Displays yesterday, today, and tomorrow dates correctly	<input checked="" type="checkbox"/>
Updated logic to affect calendar by translation ( <i>Note: Initially the Language Switch did not change for calendar</i> )	<input checked="" type="checkbox"/>

Mood Tracker	Done
CRUD: User can add mood to DB (Mood Log)	<input checked="" type="checkbox"/>
Retrieve mood log and plot "Mood of the Day" on graph	<input checked="" type="checkbox"/>
Verified graphs display correctly using test JSON data	<input checked="" type="checkbox"/>
Language translation applies correctly when switching languages	<input checked="" type="checkbox"/>
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.	<input checked="" type="checkbox"/>
Feedback message displayed after mood is logged to confirm submission	<input checked="" type="checkbox"/>
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	<input checked="" type="checkbox"/>

### AGA App Feature Testing Form

AGA Bot Interaction and Navigation	Done
------------------------------------	------



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

## 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

<b>Ease of Navigation and Overall Usability</b>	<p><b>High Ease of Use</b> 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. <i>Future Implementation may be to improve UI to be more dynamic, applying a tighter grid layout on features in the Main Page.</i></p> <p><b>Device Compatibility</b> 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.</p>
<b>User Interface Design</b>	<p><b>Positive Impressions</b> Users appreciated the aesthetic appeal of the site, often describing it as “pleasant,” “colourful,” “cute,” and “modern.”</p> <p><b>Visual Feedback Features</b> The mood-based affirmation system received positive remarks. Users noted that the mood tracking feature was engaging and added a sense of personal connection.</p>

	<b>Minor UI Suggestions</b> <ul style="list-style-type: none"> <li>• A few users mentioned the icons (particularly in the top right corner) were too small when using the webapp on a phone.</li> <li>• Some requested separate buttons for settings and profile, as the current merged layout was a bit confusing.</li> </ul>
<b>Functional Feedback</b>	<b>Task Management</b> Users found task creation and editing to be quick and straightforward.  <b>Deactivation Flow</b> 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	
<b>Objective</b> 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	
<b>1</b>	Focus Detection
<b>Test Case</b>	Verify that the bot accurately detects the user's eyes and ears while in Focus Mode.
<b>Expected Outcome</b>	The bot successfully identifies the user's presence and confirms they are working/studying. ( <i>Turn Green</i> )
<b>2</b>	Loss of Focus Detection
<b>Test Case</b>	Scenario where the user looks away or remains still for an extended period.
<b>Expected Outcome</b>	The bot detects the loss of focus and turns red to alert the user.
<b>3</b>	Break Recommendation
<b>Test Case</b>	Users remain focused for 30 minutes or more.
<b>Expected Outcome</b>	The bot recommends a break by turning blue and displaying " <i>break</i> ".
<b>4</b>	Environmental Challenges
<b>Test Case</b>	Evaluate the bot's focus detection in different lighting conditions and with potential distractions in the background.
<b>Expected Outcome</b>	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	
<b>Objective</b> 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	
<b>1</b>	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.

```
if eyes_detected == 2:
    left_ear = self.get_eye_aspect_ratio(left_eye)
    right_ear = self.get_eye_aspect_ratio(right_eye)
    avg_ear = (left_ear + right_ear) / 2.0

    if avg_ear >= EAR_THRESHOLD:
        user_looking = True
        self.eye_frame_count = 0
    else:
        self.eye_frame_count += 1
```

Figure 11. 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.

```
# check stability for face and head/body
if face_features is not None and self.is_stable(face_features, self.last_face_features,
self.stability_tolerance):
    self.face_stable_frame_count += 1
else:
    self.face_stable_frame_count = 0 # reset if facelandmarks are not stable/detected
```

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

```
self.last_face_features = face_features
self.last_head_position = head_position
```

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.

```
# determine if user is stable or if distracted (alert [ ! ])
is_both_stable = (
    face_stable >= self.face_detector.stability_threshold and body_stable >= self.face_detector.stability_threshold
)
is_body_stable = body_stable >= self.face_detector.stability_threshold
is_eye_distracted = eyes_detected < 2 or self.face_detector.eye_frame_count >= CONSECUTIVE_FRAMES
```

Figure I4. Determine User's Focus Level (Concentrated/Stable or Distracted)

```
if is_both_stable or is_body_stable or is_eye_distracted:
    self.bot_expression.expression = "alert"
    self.start_time = time.time()

elif user_looking and eyes_detected == 2:
    self.focused_expression()
```

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

<b>Happy</b>	Task completed or triggered every N minute
<b>Neutral</b>	Idle state or waiting for input
<b>Alert</b>	When User loses focus, it prompts an alert face
<b>Break</b>	When User is in focus for N minutes, it prompts a message for break

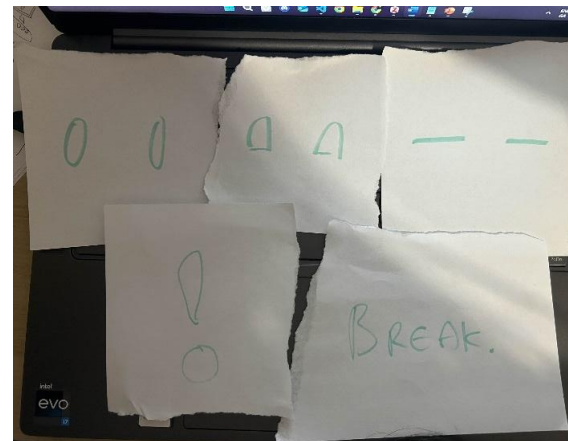


Figure 16. Face Expressions Prototype

```
elif self.expression == "neutral":
    # oval eyes [ 0 0 ]
    pygame.draw.ellipse(self.screen, EYE_COLOUR, (140, 160, 37, 47))
    pygame.draw.ellipse(self.screen, EYE_COLOUR, (228, 158, 35, 45))
```

Figure 5.2.B Neutral Expression of AGA (Base Face)

```
if self.expression == "happy": # Idea: (0 + _ = D)
    # left eye
    pygame.draw.ellipse(self.screen, EYE_COLOUR, (140, 160, 37, 47)) # half oval
    pygame.draw.rect(self.screen, BACKGROUND_COLOUR, (140, 182, 37, 28)) # flat bottom

    # right eye
    pygame.draw.ellipse(self.screen, EYE_COLOUR, (228, 158, 35, 45)) # half oval
    pygame.draw.rect(self.screen, BACKGROUND_COLOUR, (228, 180, 35, 28)) # flat bottom
```

Figure 5.2.C Building the Happy Expression of AGA

```
elif self.expression == "attitude":
    # line eyes [ - - ]
    pygame.draw.line(self.screen, EYE_COLOUR, (130, 180), (185, 180))
    pygame.draw.line(self.screen, EYE_COLOUR, (215, 180), (270, 180))
```

Figure 5.2.E Building Attitude Expression of AGA

```
elif self.expression == "break":
    # No face but [ Break? ] to alert user*
    # create font object, add text in white and center text
    font = pygame.font.SysFont(None, 60) # font object
    text = font.render("Break?", True, (255, 255, 255))
    text_rect = text.get_rect(center=(WIDTH // 2, HEIGHT // 2))

    self.screen.blit(text, text_rect)
```

Figure 5.2.B Building Break Expression of AGA

```
elif self.expression == "alert":
    # No face but [ ! ] to alert user*
    # find center position
    center_x, center_y = 200, 200

    # draw exclamation mark for alert
    bar_width, bar_height = 20, 60
    bar_x = center_x - bar_width // 2
    bar_y = center_y - bar_height
    pygame.draw.rect(
        self.screen,
        (255, 255, 255),
        (bar_x, bar_y, bar_width, bar_height),
        border_radius = 10
    )

    dot_radius = 10
    dot_x, dot_y = center_x, center_y +
    pygame.draw.circle(
        self.screen,
        (255, 255, 255),
        (dot_x, dot_y),
        dot_radius
    )
```

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.

Milestone	Start Date	End Date
Feasibility Research, Design & Project Management	Nov 04, 2024	Nov 08, 2024*
Prototype & Review (Testing)	Nov 09, 2024	Nov 16, 2024
Code Implementation	Nov 17, 2024	Dec 14, 2024
Testing	Dec 15, 2024	Dec 21, 2024

*Figure 6.1.1.A Milestones First Semester*

Milestone	Start Date	End Date
Product Review	Jan 05, 2025	Jan 18, 2025
Refinement 01	Jan 19, 2025	Feb 08, 2025
Refinement 02	Feb 09, 2025	Feb 28, 2025
Review & Testing (FINAL)	Mar 01, 2025	Mar 15, 2025
Documentation & Project Launch	Mar 16, 2025	Mar 29, 2025
Official Website Development (One-Page)	Mar 30, 2025	Apr 05, 2025
Project Submission	Apr 06, 2025	Apr 12, 2025
Project Completion	Apr 13, 2025	Apr 19, 2025

*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.

<b>To Do</b> This stage includes all pending tasks, organised by labels such as <i>Stories</i> , <i>Tasks</i> , and <i>Bugs</i> . Each item represents a possible issue or feature for the project. Uncompleted tasks stay in the backlog until allocated catch-up time.	<b>In Progress</b> 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."
<b>Review &amp; Testing</b> 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.	<b>Done</b> 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 Božic 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>.

### 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

To mitigate software bugs and errors, regular testing and continuous review of the issue board are essential. Non-functioning features should be flagged immediately, and corrective actions must be taken either within the current iteration or added to the backlog for scheduled review and resolution in future iterations.

##### ➔ Feature Testing:

Each feature, whether newly built or updated, undergoes thorough testing to ensure it functions as expected. This process helps identify bugs early and ensures features meet the required standards of quality and performance.

- ##### ➔
- Minor errors that do not significantly impact the core functionality of a feature are placed in the backlog. These are reviewed periodically and resolved as part of scheduled maintenance or future updates, ensuring they do not hinder the overall user experience.

#### ➤ 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*.

#### ➤ Object-Orientated Approach

Object-Oriented Programming (OOP) principles were applied throughout the development process, primarily for reusability, modularity, and maintainability. By breaking the system into components, the code became more flexible and easier to extend or modify over time. The OOP approach also allowed for better organisation, making it easier to troubleshoot, scale, and update the web application and companion device in the future. This method ensures that the system can be adapted for long-term use, similar to how it would be approached in a professional development environment.

## User Risks

### ➤ **User Satisfaction and UX Failures**

User satisfaction and potential UX failures are addressed through UX testing cases that prioritise user feedback to enhance usability. The goal is to identify pain points early and make iterative improvements, ensuring the application remains user-friendly and intuitive. This is a top priority during the second semester, focusing heavily on refining the user interface and experience through continuous testing and feedback loops.

➔ From Testing and Evaluation, *UI & UX Testing*

### ➤ **User Communication**

Engaging directly with users to understand their needs and expectations is crucial for the success of the application. Regular communication with users helps to prioritise features that genuinely benefit their experience and improve the overall usability of the web application. Feedback gathered through these interactions informs design decisions and functional updates, ensuring the product aligns with user requirements.

➔ 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**

A "freeze point" is established to halt the introduction of any new features or changes, solidifying the final scope of the project. This approach ensures that the development phase is completed efficiently and on time, allowing for adequate time to focus on polishing and finalising the project deliverables.

For this project, the freeze point was applied one week before the deadline, providing a time allowance to complete the final report and prepare the presentation slides.

## Legal and Regulatory Risks

### ➤ **Data Privacy Compliance**

It is crucial to ensure that all user data handling complies with GDPR and other relevant data privacy regulations. This includes ensuring proper storage and processing of personal data and offering users clear options to access or delete their data. Implementing these privacy standards ensures the application is both trustworthy and secure, meeting the legal and ethical obligations required for user protection.

➔ Included in Project Scope and Non-Functionality Requirements

### ➤ **Age Restrictions and Safety**

Age restrictions must be considered to ensure the product is safe and accessible for younger audiences. This involves implementing age verification methods, adhering to legal

frameworks designed to protect minors online, and ensuring that content and features are age appropriate. This ensures that the application is compliant with regulations that safeguard younger users while remaining accessible to all age groups.

## 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 will be introduced on the web application to enhance accessibility for users who may prefer not to invest in the physical companion device. This web-based version will offer the core functionalities of Focus Mode, providing users with the ability to minimise distractions, set task timers, and receive gentle reminders to take breaks, thereby promoting sustained focus and productivity.

However, due to limitations in resources and the absence of the specialised hardware found in the physical device, the web version will have reduced capabilities compared to the full functionality offered by the companion bot. While the physical device integrates real-time facial detection, animated expressions, and passive interaction for a more immersive experience, the web app will focus on the essential elements of task management and distraction-free work environments, providing a simpler but still effective solution for users.

#### Other

- ➔ **Dark Theme Mode:** Implemented as an optional display setting, catering to users who prefer a darker interface. This helps reduce eye strain, especially in low-light environments, and provides a more comfortable viewing experience. Offering a dark theme mode also aligns with modern design trends, ensuring accessibility for a wider range of users.
- ➔ **Update About Us Page:** Include a more detailed origin story of AGA's name and creation process. This includes a deeper explanation of how the name "AGA" was chosen, its symbolic connection to unconditional love (Agape) and growth (leaf symbol), as well as the journey behind the development of the product. By adding this narrative, users will gain a better understanding of philosophy, values, and vision that shaped AGA, helping to strengthen the emotional connection with the product.

#### AGA Bot

- **Weather Integration & AI Suggestions:** This feature provides real-time weather updates based on the user's location, offering important insights such as temperature and weather conditions. Integrated with AI-generated suggestions, it helps users prepare for their day by recommending appropriate actions, such as suggesting an umbrella for rain or advising on suitable clothing for the weather. These suggestions make daily preparation effortless,

ensuring that users can approach the day well-prepared and avoid weather-related disruptions.

- **Wellbeing Tools:** A suite of wellness exercises is available to support both mental and physical health. This includes activities like breathing exercises, stretching routines, and mindfulness prompts, all designed to reduce stress and improve focus. Additionally, activity tracking allows users to log in their physical activities and monitor their progress, promoting a balanced lifestyle. Tailored wellbeing recommendations are provided to support the user's specific needs, whether they're looking to improve sleep quality, manage stress, or increase physical activity.
- **Task Reminders System:** The smart reminder system is designed to help users stay on top of their daily responsibilities without feeling overwhelmed. Each morning, the system reads out the day's tasks, providing a clear overview of the schedule ahead. Throughout the day, midday check-ins remind users of any pending tasks, ensuring nothing is forgotten. In the evening, the system offers a preview of the next day's tasks, preparing users mentally for what's ahead and helping them wind down with a sense of readiness for the following day.

## 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 both the

feasibility and potential of the companion device in supporting individuals who struggle with organisation, time management, and task prioritisation.

Throughout this development journey, I have challenged myself by learning and applying new technologies - utilising TypeScript and Tailwind CSS for the web application, and employing tools such as OpenCV, DLib, and Kivy, alongside an object-oriented approach in Python, for coding the companion device. These choices not only enhanced the system's overall functionality but also enabled me to broaden my technical skill set and problem-solving abilities.

This year-long project provided invaluable learning experiences across multiple areas: from building a responsive web application and a companion bot using a Raspberry Pi, to applying effective project management, conducting feasibility studies, and implementing system design principles.

More importantly, it significantly deepened my understanding of ADHD and reinforced the importance of designing digital tools that prioritise mental wellbeing, accessibility, and user-centred support. I realised that individuals facing mental health challenges require more than just generic productivity tools - they need tailored, adaptable systems that not only respond to their unique needs but also foster a sense of empowerment and control over their lives. This project has inspired me to continue exploring how technology can be used to create truly supportive, inclusive solutions for mental health.

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## Appendix

### Testing Forms

ADHD and Daily Life Questionnaire
<b>Understanding ADHD and Daily Challenges</b>
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?
<b>Current Tools and Resources</b>
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?
<b>Desired Features</b>
What features are you looking for in apps or tools designed to support ADHD?
<ul style="list-style-type: none"> <li>▪ Which features have been most helpful for you?</li> <li>▪ Which features have not worked or been effective for you?</li> </ul>
<b>Proposed Solution</b>
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

## Share Your Thoughts: AGA UI/UX Test Form

Hello!

My name is Lovely Fernandez, and I'm the creator of AGA – the *Advanced Guidance Assistant*. This website is being developed as part of my final year university project, and I'm currently in the testing phase. I truly appreciate you volunteering your time to help me by providing feedback – your input is incredibly valuable in improving how AGA works and feels for everyday users.

AGA is designed to help people stay organised, manage their time more effectively, and maintain a balanced daily routine. Life can often feel overwhelming, and AGA aims to offer clear, supportive guidance through a simple and easy-to-use website.

During this short testing session, I'd love your honest thoughts on how easy the website is to use and how you find the overall experience. You'll be asked to complete a few tasks – just follow the steps and let me know how you get on. After that, feel free to explore the rest of the site and share any extra thoughts or feedback.

Please click the following link to open the website: <https://aga-website-c0757.web.app/>

*The test should take around 15 to 30 minutes. Please also note that the media platforms are currently unavailable.*

Section 1

...

### Task 1: Create Account and Upload a Photo

#### Create an Account

1. Open the AGA app or website.
2. Click on "Sign Up" or "Create Account."
3. Fill in the required information (e.g., name, email, and password) and submit the form to complete your account setup.

#### Update Profile Settings

1. Log in and go to Settings.
2. Upload a profile photo - click on the photo/avatar section and choose an image from your device.
3. Change your password. Find the password section, enter your current password, then enter and confirm your new password.
4. Save your changes when you're done.

#### 1. How easy was it to navigate the task? \*

Very easy      Easy      Moderate      Hard      Difficult

Task 1

☐      ☐      ☐      ☐      ☐

#### 2. Did you encounter any difficulties? (If yes, please provide further details below.)

Enter your answer

#### 3. General Feedback

Enter your answer

Section 5

...

## Overall Feedback

I'd love to hear more about your experience.

Let me know if you have any suggestions, noticed any errors, ran into anything that didn't work as expected, or found features that you really liked. Your input helps AGA's development!

### 13. Feedback & Suggestions

Enter your answer

### 14. What device did you use? (Phone, Tablet, Laptop, etc.) \*

Enter your answer

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.