

SCSV 2113

HUMAN COMPUTER INTERACTION

(Session 2025/2026 Semester 1)

Faculty of Computing
Universiti Teknologi Malaysia

P1 – PROJECT PROPOSAL

[Project Title : Smart Desk Organizer & Productivity Assistant]

LECTURER

NOR ANITA FAIROS BINTI ISMAIL

(Section 0X)

GROUP NO 1 (Group SDO)

Prepared by

MUHAMMAD SYAFIQ BIN AB RAZAK	SX240659ECJHS04
MUHAMMAD BADRUL HISYAM BIN MAT ROSLI	SX231719ECJHF04
MUHAMMAD SYAZWAN BIN KAMARUZAMAN	SX240290ECRHS04
MUHAMMAD THAQIF BIN ABDUL AZIZ	SX231702ECJHF04
PUTRA NAZREEN HAFIZ BIN ABDUL KARIM	SX240247ECJHS04

1. Problem Statement

Many people such as student, working adults, and older folks is struggling to keep up with their workspace tidy, manage their time well, and stay focus. For elderly user, there are extra challenges like remembering to take medicine, keeping track of their health, and staying in touch with family . Regular desk organizers dont help with this things. They dont have smart features that support productivity, health, or accessibility. People often forget important items, which causes stress and wastes time. Most desks dont have interactive surfaces for writing, drawing, or sharing ideas.

2. Objectives

- To build a smart desk organizer that helps users manage both physical and digital clutter.
- To include sensors, gesture controls, stylus support, and Ai to track how users use their desk, their habits, and even their health.
- To give personalized tips, reminders, and alerts to help users stay productive and healthy.
- To help users focus better, stay organized, manage time, and keep track of their health.
- To make the desk easy to use for people of all ages and abilities, using gestures and voice commands.
- To let users check if they have left anything behind using their phone, so they dont forget important items.
- To offer a surface that users can write or draw on, and even project things like schedules or shared documents for group work or creative tasks.

3. Proposed Solution

By proposing a smart desk organizer with built in sensors, gesture and voice control, a touchscreen that works with a stylus, and projection features. It will also come with a mobile app that can integrate with the table, and smart watch.

The system will:

- Track items on the desk like books, gadgets, medicine, keys, and wallets.
- Remind user about tasks, deadline, and when to take medicine.
- Use Ai to learn user habits and give helpful tips for productivity and wellness.
- Send motivational message and health alerts.
- Work with smartwatches and phone to track health and activity.
- Let user control the desk in real time through the app, and remind users if something is missing.
- Let users write, draw, and take notes directly on the desk screen using a stylus.
- Project things like schedules, reminders, or shared documents onto the desk or wall to help with group work or learning.

4. Key Features

- Item tracking:
 - where the table knows when there is item are picked up or put back, helping users find things and track usage.
- Gesture controls:
 - Let users control timers and other features with simple hand movements which is great for people with limited mobility or vision.
- Voice command:
 - Users can talk to the desk or app to set reminders, check their schedule, or ask for health information updates.
- Stylus support:
 - The desk screen lets users write, draw, and take notes, which is perfect for students, professionals, and artists.
- Projection features:
 - Can show schedules, reminders, or shared content on the desk or wall for presentations or group work.
- Personalized plans:
 - AI suggests daily or weekly plans based on user habits and goals.
- Motivational notifications:
 - Sends helpful reminders and encouragement.
- Medication and health tracking:
 - Reminds users to take medicine and tracks basic health information through smartwatches and phones.
- Companion App:
 - Lets users set goals, get notifications, and track health and productivity.
- Family integration:

- Share health and activity info with family for extra support.
- Real time item check:
 - Shows which tagged items are on the desk through the app, app reminds users if something's missing.

5. Target Users

- University students
- Remote workers
- Office employees
- Elderly users who need help with health and medication
- Family members
- People with accessibility needs
- Creative professionals and teams.

6. Expected Impact

- Quality education:
 - Helps users study better and work together more easily.
- Decent work and economic growth:
 - Support better work quality habits and reduce medication.
- Reduced inequalities:
 - Makes workspaces more accessible for everyone.
- Industry, innovation and infrastructure:
 - Encourage smart workspace technology.

7. Methodology

- Research:
 - Talk to users through surveys and interviews to learn about their workspaces and health
- Design:
 - Create sketches and prototypes for the desk and app, including gesture, stylus, projection, and voice features.

- Development:
 - Build a working model using camera modules, gesture sensors, a stylus touchscreen, and projection tools. Develop the mobile app with health and accessibility features.
- Testing:
 - Let users try the system and give feedback.
- Evaluation:
 - Measure how well it improves productivity, health, accessibility, and user satisfaction.

8. Project Timeline

Phase	Duration
Research	2 weeks
Design	2 weeks
Development	4 weeks
Testing	2 weeks
Evaluation	1 week

9. Resources Needed

- Camera modules
- Gesture sensors
- Microcontroller
- Microphone
- Stylus enable touchscreen
- Projection hardware
- Mobile app development tools
- Smartwatch integration tools
- Workspace for building and testing

10. Conclusion

The smart desk organizer and productivity assistant is designed to make workspaces smarter and more helpful. It combines physical organization with digital tools to help users stay focused, manage their time, and take care of their health. Whether you are a student trying to study better, a professional working from home, or an elderly person needing reminders and support, this desk can

make everyday tasks easier. It also helps people with disability by offering gesture and voice controls. With features like stylus input, projection, and real time item tracking, this desk supports creativity, collaboration, and peace of mind. Overall, its a modern solution for wide range of users who want to work smarter and live better.

SCSV 2113

HUMAN COMPUTER INTERACTION

(Session 2024/2025 Semester 2)

Faculty of Computing
Universiti Teknologi Malaysia

P2 – ESTABLISHING REQUIREMENTS

[Project Title: Smart Desk Organizer & Productivity Assistant]

LECTURER

NOR ANITA FAIROS BINTI ISMAIL

(Session 2025/2026 Semester 1)

Faculty of Computing Universiti Teknologi Malaysia

GROUP NO 3 (SDO)

Prepared by

MUHAMMAD SYAFIQ BIN AB RAZAK	SX240659ECJHS04
MUHAMMAD BADRUL HISYAM BIN MAT ROSLI	SX231719ECJHF04
MUHAMMAD SYAZWAN BIN KAMARUZAMAN	SX240290ECRHS04
MUHAMMAD THAQIF BIN ABDUL AZIZ	SX231702ECJHF04
PUTRA NAZREEN HAFIZ BIN ABDUL KARIM	SX240247ECJHS04

1.0 PROPOSED TASKS

Based on the identified productivity, organization, and ergonomic challenges faced by users in daily desk-based activities, three core tasks were established to guide the requirement-gathering and task analysis process for the Smart Desk Organizer & Productivity Assistant system.

These tasks represent the most frequent and critical interactions users would have with the system and are designed to reflect real-world usage across different user groups.

Task 1: Set Up Personal Desk Profile and Preferences

This task focuses on the initial configuration of the smart desk system, including user identification, work habits, notification preferences, ergonomic settings, and desk layout customization.

Task 2: Manage Daily Work Session and Smart Desk Interaction

This task involves real-time interaction with the smart desk during work or study sessions, including task reminders, posture monitoring, desk organization prompts, and focus assistance.

Task 3: Review Productivity Data and Desk Usage History

This task allows users to review their productivity trends, posture habits, task completion records, and workspace usage data to support self-reflection and long-term improvement.

2.0 PERSONAS

To ensure a user-centered design approach, three personas were developed to represent distinct user groups with different productivity needs, technological familiarity, and physical considerations. These personas guided the development of scenarios, task analyses, and system requirements.

2.1 PERSONA 1 – Student

Name: Adam Farhan

Age: 22

Occupation: University Student

Lifestyle:

Adam is a full-time university student who spends long hours studying, attending online classes, and completing assignments at his desk. His daily routine often involves multitasking between lecture notes, a laptop, notebooks, and mobile devices. Due to irregular schedules and academic pressure, Adam frequently experiences cluttered desk conditions and poor posture during prolonged study sessions.

Goals:

- Improve focus and time management during study sessions
- Maintain a tidy and organized desk environment
- Reduce physical discomfort caused by poor posture
- Build consistent and productive study habits

Challenges:

Adam often underestimates the impact of desk organization and posture on his productivity. He forgets to take breaks, misplaces essential items, and experiences back and neck strain after long study periods. Existing productivity tools help with scheduling but do not address physical workspace issues or provide real-time guidance.

2.2 PERSONA 2 – Elderly User

Name: Encik Roslan

Age: 63

Occupation: Retired Government Officer

Lifestyle:

Encik Roslan spends much of his time at home reading, managing personal documents, and occasionally using a computer for communication or online services. His movements are slower, and he experiences mild joint stiffness and reduced eyesight. He prefers simple, calm environments and avoids complex technology.

Goals:

- Maintain comfort and safety while using a desk
- Receive gentle reminders for posture and breaks
- Keep essential desk items within easy reach
- Avoid physical strain during prolonged sitting

Challenges:

Encik Roslan finds modern smart devices overwhelming due to small text, complex interfaces, and fast-paced interactions. He often forgets to take breaks and may unknowingly maintain poor sitting posture, which increases discomfort over time.

2.3 PERSONA 3 – Young Busy Professional

Name: Daniel Lim

Age: 32

Occupation: Remote Software Developer

Lifestyle:

Daniel works remotely and spends most of his day at his desk attending virtual meetings, coding, and managing deadlines. His workspace must support long hours of focused work while allowing flexibility for short breaks. Efficiency and automation are critical for him.

Goals:

- Maximize productivity with minimal distractions
- Maintain ergonomic posture during long work hours
- Track work patterns and productivity trends
- Automate reminders without interrupting workflow

Challenges:

Daniel struggles with burnout due to prolonged sitting and poor work-life boundaries. While he uses productivity apps, they often require manual input and fail to integrate physical workspace management, posture awareness, and task timing into a single system.

3.0 SCENARIOS

3.1 Task Scenario 1: Set Up Personal Desk Profile and Preferences (Adam Farhan)

When Adam sets up the Smart Desk Organizer & Productivity Assistant for the first time, he is prompted to create a personal desk profile. The system asks for basic information such as preferred study duration, typical break intervals, and desk usage patterns. Adam selects “Study Mode” and chooses reminders for posture correction and desk tidiness.

However, without intelligent guidance, Adam feels unsure about what ergonomic settings suit him best. He does not fully understand how desk height, chair position, and screen alignment affect his posture. A poorly designed setup process could discourage him from completing the configuration.

Adam needs a system that guides him step by step, explains settings in simple terms, and allows flexibility to adjust preferences later without feeling overwhelmed.

3.2 Task Scenario 2: Manage Daily Work Session and Smart Desk Interaction (Encik Roslan)

Encik Roslan sits at his desk to read documents and manage bills. After some time, he unknowingly slouches forward, causing discomfort in his lower back. Traditional desks provide no feedback, and he remains unaware until pain develops.

With the Smart Desk Organizer system, gentle alerts appear through visual cues and calm audio prompts reminding him to sit upright and take short breaks. The system adapts its reminders based on his pace and does not overwhelm him with frequent notifications.

Without such adaptive interaction, Encik Roslan would continue unsafe sitting habits that gradually affect his well-being.

3.3 Task Scenario 3: Review Productivity Data and Desk Usage History (Daniel Lim)

After a week of remote work, Daniel wants to evaluate how effectively he used his time. He opens the Smart Desk Organizer dashboard to review productivity summaries, posture duration, and break frequency.

Instead of seeing meaningful insights, many existing tools only show surface-level data such as total hours worked. Daniel needs accurate information that reflects actual focused work, physical strain, and desk usage patterns.

A system that presents clear, honest, and actionable data helps Daniel make informed decisions about improving his work routine and preventing burnout.

TITLE: GATHERING REQUIREMENT – TASK ANALYSIS

1.0 INTRODUCTION

The purpose of this task analysis is to systematically identify usability issues, user needs, and functional gaps related to desk-based productivity and workspace management. By analyzing how different users interact with their desks during daily activities, this study aims to derive clear and justifiable system requirements for the **Smart Desk Organizer & Productivity Assistant**.

To achieve this, three core tasks were assigned to representative user personas:

1. Setting up personal desk profile and preferences
2. Managing daily work or study sessions using the smart desk
3. Reviewing productivity data and desk usage history

Each task was designed to reflect realistic scenarios encountered by users in academic, professional, and home environments. The task analysis focuses not only on digital interaction

but also on physical interaction with the desk environment, including posture maintenance, item organization, and break management.

The first task, *Set Up Personal Desk Profile and Preferences*, evaluates how effectively users can configure the system according to their work habits, ergonomic needs, and notification preferences. This task is critical as it establishes the foundation for personalization and long-term user engagement.

The second task, *Manage Daily Work Session and Smart Desk Interaction*, examines real-time interaction between the user and the smart desk during active work or study sessions. This includes monitoring posture, receiving reminders, managing focus intervals, and responding to desk organization prompts. The goal of this task is to assess whether the system can support users without causing distraction or cognitive overload.

The third task, *Review Productivity Data and Desk Usage History*, focuses on how users interpret and utilize feedback provided by the system. Users evaluate summaries of productivity trends, posture behavior, break frequency, and workspace usage to determine whether the data accurately reflects their real activities and supports self-improvement.

By conducting this task analysis across multiple personas—namely a university student, an elderly user, and a young busy professional—the study ensures that the Smart Desk Organizer & Productivity Assistant addresses diverse physical abilities, technological familiarity levels, and productivity goals. The findings from this analysis form the basis for refining Hierarchical Task Analysis (HTA) models and establishing precise functional and non-functional requirements in subsequent sections.

2.0 REFINEMENT / DERIVATION OF HIERARCHICAL TASK ANALYSIS (HTA)

This section presents the refinement and derivation of **Hierarchical Task Analysis (HTA)** for the Smart Desk Organizer & Productivity Assistant. The HTA is developed to decompose each proposed task into structured sub-tasks, enabling a clear understanding of user actions, decision points, and system interactions.

The HTA process is grounded in the previously defined personas and scenarios to ensure that task flows accurately represent real-world usage. By analyzing each task from the perspectives of different user groups, this approach highlights variations in user behavior, physical capability, and interaction preferences. These insights are essential for identifying usability challenges and deriving system requirements that support accessibility, efficiency, and user satisfaction.

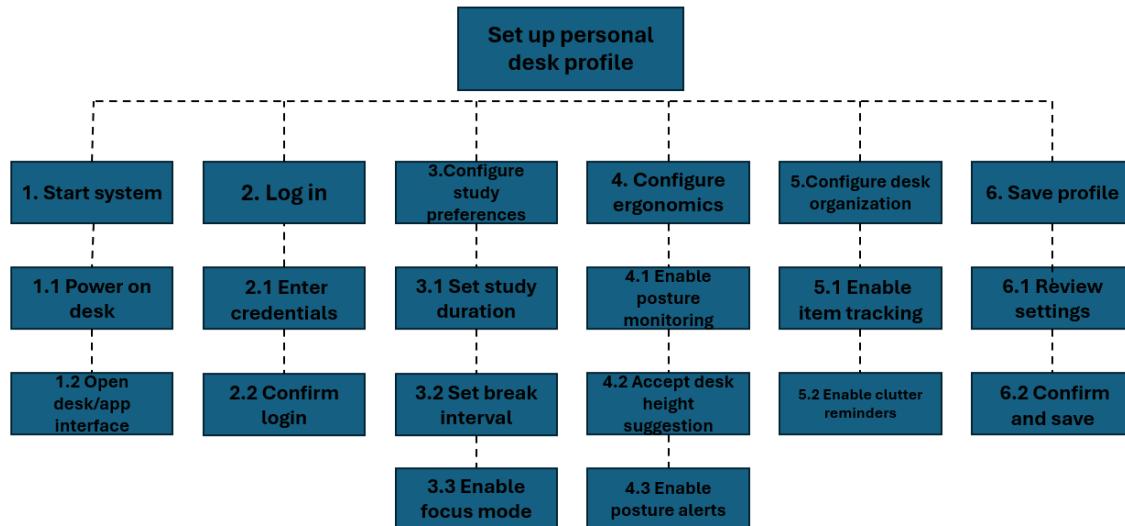
Three primary tasks are analyzed:

1. Set Up Personal Desk Profile and Preferences
2. Manage Daily Work Session and Smart Desk Interaction
3. Review Productivity Data and Desk Usage History

Each task is broken down into hierarchical steps and examined across the three personas: a university student, an elderly user, and a young busy professional. This ensures that the system design accommodates diverse needs while maintaining consistency in core functionality.

2.1 HIERARCHICAL TASK ANALYSIS FOR TASK 1

[Set Up Personal Desk Profile and Preferences]

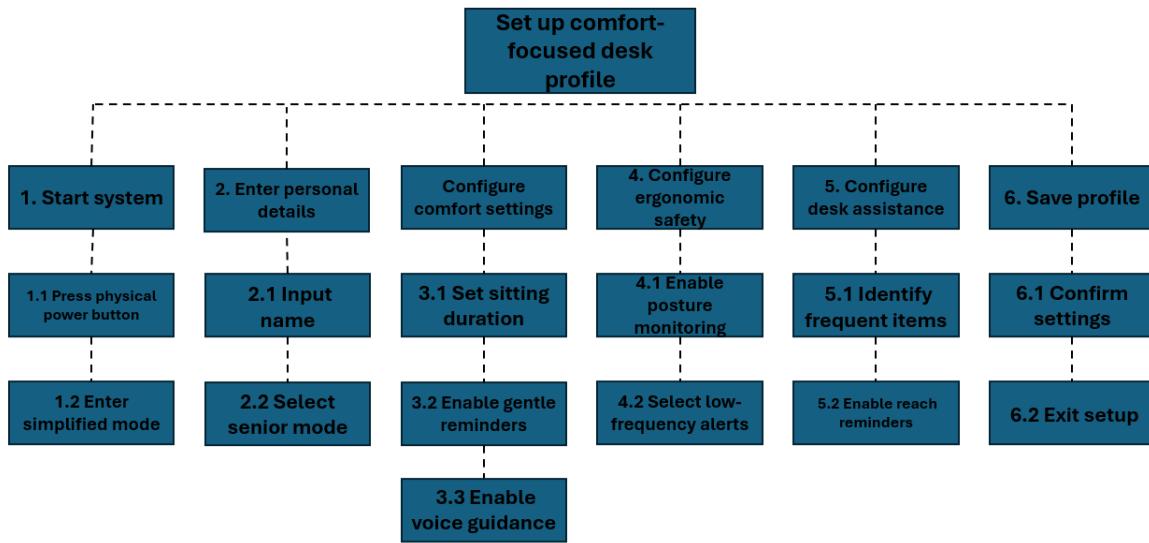


2.1.1 User 1: Adam Farhan – University Student

0. Set up personal desk profile and preferences

1. Start the smart desk system
 - 1.1 Power on the desk system
 - 1.2 Access the system interface via desk display or mobile application
2. Log in or create user profile
 - 2.1 Enter user credentials
 - 2.2 Confirm successful login
3. Configure study-related preferences
 - 3.1 Select preferred study duration
 - 3.2 Set break interval frequency
 - 3.3 Enable focus mode reminders
4. Configure ergonomic settings
 - 4.1 Enable posture monitoring
 - 4.2 Accept recommended desk height and screen alignment
 - 4.3 Activate posture correction notifications

5. Configure desk organization assistance
 - 5.1 Enable desk item monitoring
 - 5.2 Set clutter alert sensitivity
 - 5.3 Select reminder frequency
6. Review and confirm settings
 - 6.1 Review summary of configured preferences
 - 6.2 Modify settings if required
 - 6.3 Save and complete setup

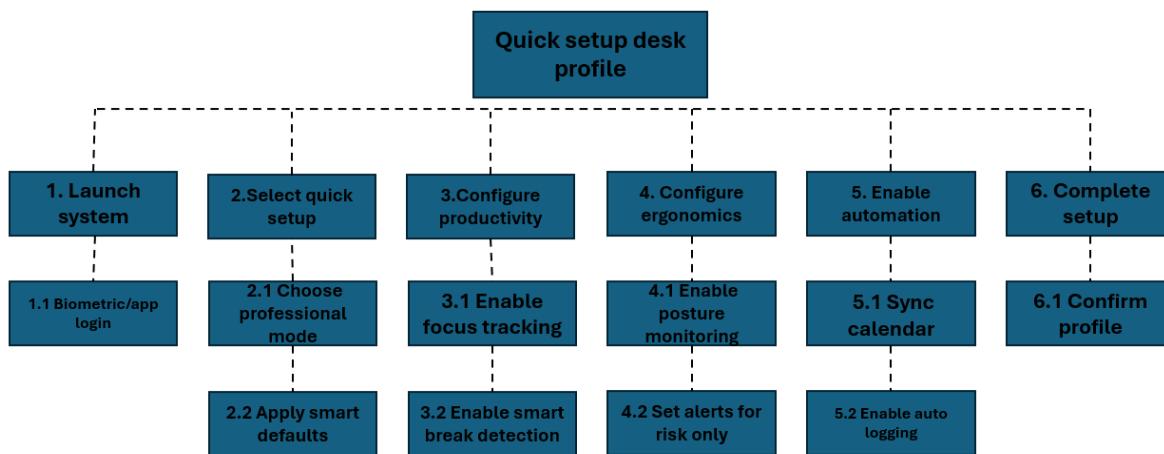


2.1.2 User 2: Encik Roslan – Elderly User

0. Set up personal desk profile and preferences

1. Activate the smart desk system
 - 1.1 Power on system using physical control
 - 1.2 Access simplified user interface
2. Enter basic personal information
 - 2.1 Input name
 - 2.2 Select age category
 - 2.3 Enable accessibility mode
3. Configure comfort and safety preferences
 - 3.1 Set maximum sitting duration
 - 3.2 Enable gentle break reminders
 - 3.3 Activate voice guidance support

4. Configure ergonomic safety features
 - 4.1 Enable posture monitoring
 - 4.2 Select low-frequency reminders
 - 4.3 Enable visual alerts with large icons
5. Configure desk accessibility assistance
 - 5.1 Identify frequently used desk items
 - 5.2 Enable reachability reminders
 - 5.3 Disable non-essential notifications
6. Confirm and save profile
 - 6.1 Review settings
 - 6.2 Save profile and exit setup



2.1.3 User 3: Daniel Lim – Young Busy Professional

0. Set up personal desk profile and preferences

1. Launch system and authenticate
 - 1.1 Log in via biometric recognition or mobile app
2. Select quick setup option
 - 2.1 Choose work profile (Professional)
 - 2.2 Allow system to apply smart defaults
3. Configure productivity preferences
 - 3.1 Enable focus tracking
 - 3.2 Enable smart break detection
 - 3.3 Enable silent notifications

4. Configure ergonomic monitoring
 - 4.1 Enable posture tracking
 - 4.2 Set alerts for high-risk posture only
5. Enable automation and analytics
 - 5.1 Enable productivity data tracking
 - 5.2 Sync with calendar or task management tools
 - 5.3 Enable automatic data logging
6. Finalize setup
 - 6.1 Review generated settings
 - 6.2 Confirm and complete setup

2.2 DISCUSSION ON FINDINGS FROM TASK 1

[Set Up Personal Desk Profile and Preferences]

Adam Farhan (University Student)

The analysis shows that Adam benefits from a structured and informative setup process. While he is comfortable using technology, he lacks awareness of ergonomic best practices. Clear explanations, visual guidance, and the ability to adjust settings later are critical to prevent confusion and disengagement during setup.

Encik Roslan (Elderly User)

For Encik Roslan, simplicity and reassurance are essential. Excessive options or fast-paced interactions may cause anxiety. The findings emphasize the need for accessibility features such as large text, voice guidance, and minimal decision-making to ensure a comfortable setup experience.

Daniel Lim (Young Busy Professional)

Daniel prioritizes speed and automation. A lengthy configuration process reduces his willingness to engage with the system. Smart defaults, quick setup options, and seamless integration with existing tools are necessary to meet his efficiency expectations.

2.3 REQUIREMENT SPECIFICATION FOR TASK 2

[Manage Daily Work Session and Smart Desk Interaction]

2.3.1 Functional Requirements

FR2.1: Real-Time Work Session Detection and Mode Activation

Description:

The system shall automatically detect when a user begins a desk-based activity and activate the appropriate session mode (e.g., Study Mode, Work Mode, or Assistance Mode).

Justification:

HTA Task 2 shows that users such as Daniel Lim prefer minimal manual interaction when starting work sessions (Steps 1.2–1.3). Automatic detection reduces setup friction and supports uninterrupted workflow. For Adam Farhan, explicit mode activation helps structure study time, while for Encik Roslan, simplified activation improves ease of use and confidence.

FR2.2: Focus and Productivity Monitoring During Active Sessions

Description:

The system shall monitor active work duration and detect prolonged periods of continuous activity or reduced focus during a session.

Justification:

According to the HTA (Steps 3–4), Adam benefits from focus reminders to maintain attention during study sessions, while Daniel requires productivity tracking without frequent interruptions. Monitoring focus enables adaptive assistance that aligns with different productivity styles.

FR2.3: Ergonomic Posture Monitoring and Alert System

Description:

The system shall continuously monitor user posture during desk usage and provide corrective alerts when poor posture is detected.

Justification:

HTA steps related to posture monitoring (Steps 5 for Adam and Daniel, Step 5 for Encik Roslan) indicate that prolonged poor posture often goes unnoticed by users. Real-time posture feedback helps prevent physical discomfort and long-term health issues, particularly for elderly users who are more vulnerable to strain.

FR2.4: Adaptive Break Reminder and Rest Management

Description:

The system shall provide break reminders based on session duration, fatigue detection, or predefined intervals, with adaptability to user preferences.

Justification:

From the HTA (Steps 6–7), all personas demonstrate a tendency to remain seated for extended periods. Adaptive break reminders support Adam's study pacing, help Daniel prevent burnout, and ensure Encik Roslan avoids prolonged sitting that may cause discomfort.

FR2.5: Desk Organization and Reachability Assistance**Description:**

The system shall detect desk clutter or frequently used items placed out of reach and provide organization or reachability reminders.

Justification:

HTA Step 7 for Adam and Step 6 for Encik Roslan highlight issues related to cluttered or poorly arranged desks. Providing organization assistance improves efficiency, reduces unnecessary movement, and enhances overall desk usability.

2.3.2 Non-Functional Requirements**NFR2.1: Minimal Disruption During Active Work Sessions****Description:**

System notifications and alerts shall be non-intrusive and context-aware, avoiding unnecessary interruptions during focused work.

Justification:

HTA findings for Daniel Lim (Steps 4.1–4.2) indicate that excessive alerts negatively impact productivity. Context-aware notifications ensure assistance is helpful without increasing cognitive load.

NFR2.2: Accessibility and Usability Across Age Groups**Description:**

The system interface shall support accessibility features such as large text, high contrast visuals, and optional voice guidance.

Justification:

Encik Roslan's HTA highlights the need for clear visual cues and voice assistance (Steps 2–5). Ensuring accessibility improves usability for elderly users and enhances overall system inclusivity.

NFR2.3: Real-Time System Responsiveness

Description:

The system shall respond to user actions and posture changes within a maximum of three seconds.

Justification:

Delayed feedback reduces trust and effectiveness of posture correction and focus assistance. Timely system responses are essential for real-time interaction as observed across all HTA task flows.

NFR2.4: Automatic Data Logging and Session Saving

Description:

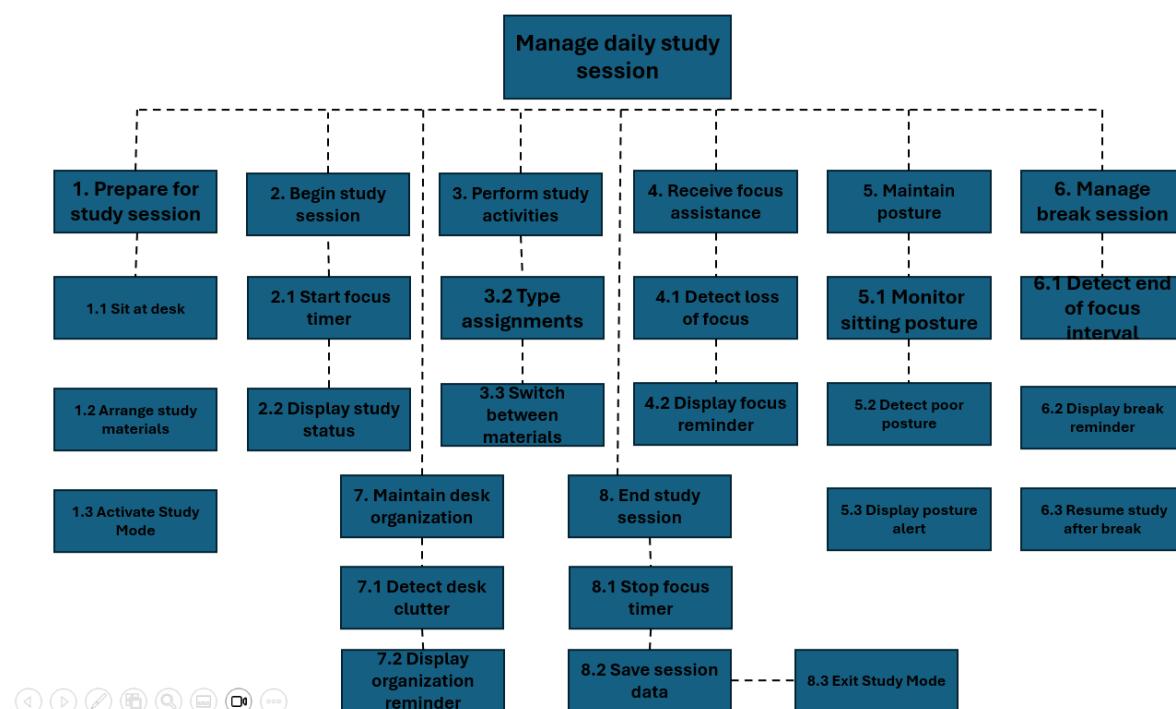
The system shall automatically save session data upon session completion without requiring manual input.

Justification:

HTA Step 8 for all personas shows that users expect session data to be recorded seamlessly. Automatic logging ensures accuracy and reduces user effort, especially for busy professionals and elderly users.

2.4 HIERARCHY TASK ANALYSIS FOR TASK

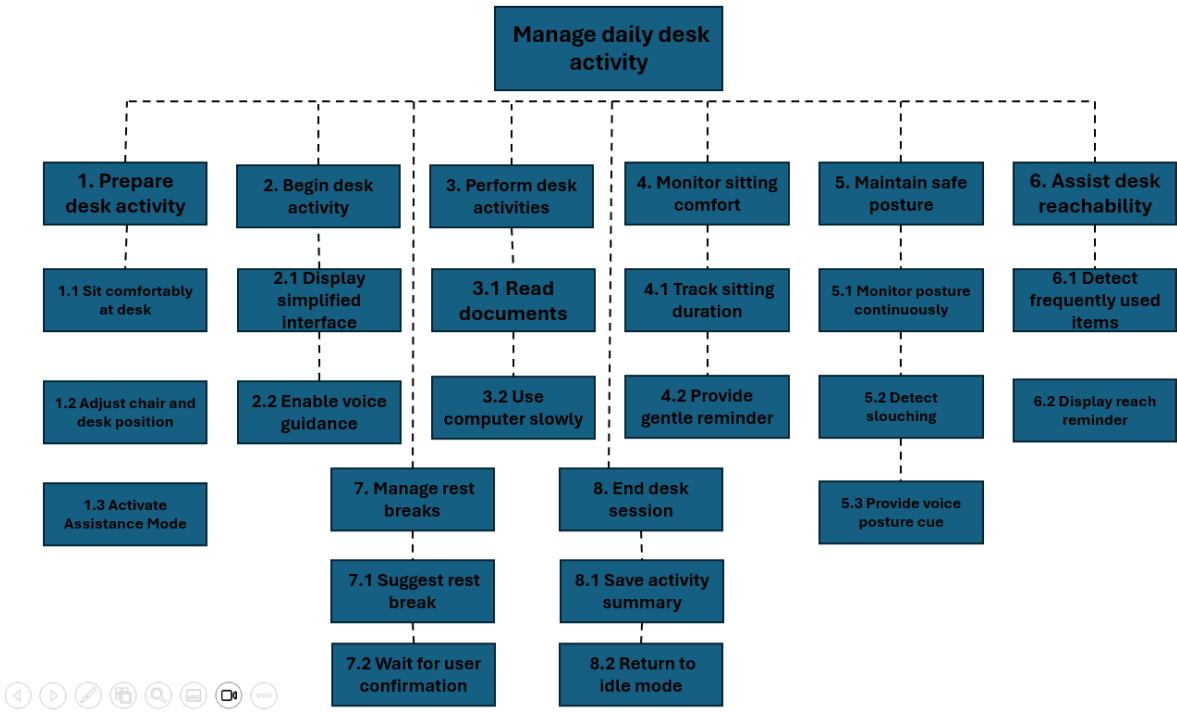
[Manage Daily Work Session and Smart Desk Interaction]



2.4.1 User 1: Adam Farhan – University Student

0. Manage daily study session

1. Prepare for study session
 - 1.1 Sit at desk
 - 1.2 Arrange study materials
 - 1.3 Activate Study Mode
2. Begin study session
 - 2.1 Start focus timer
 - 2.2 Display study status
3. Perform study activities
 - 3.1 Read lecture notes
 - 3.2 Type assignments
 - 3.3 Switch between materials
4. Receive focus assistance
 - 4.1 Detect loss of focus
 - 4.2 Display focus reminder
5. Maintain posture
 - 5.1 Monitor sitting posture
 - 5.2 Detect poor posture
 - 5.3 Display posture alert
6. Manage break session
 - 6.1 Detect end of focus interval
 - 6.2 Display break reminder
 - 6.3 Resume study after break
7. Maintain desk organization
 - 7.1 Detect desk clutter
 - 7.2 Display organization reminder
8. End study session
 - 8.1 Stop focus timer
 - 8.2 Save session data
 - 8.3 Exit Study Mode



2.4.2 User 2: Encik Roslan – Elderly User

0. Manage daily desk activity

1. Prepare desk activity

- 1.1 Sit comfortably at desk
 - 1.2 Adjust chair and desk position
 - 1.3 Activate Assistance Mode

2. Begin desk activity

- 2.1 Display simplified interface
 - 2.2 Enable voice guidance

3. Perform desk activities

- ### 3.1 Read documents

3.2 Use computer slowly

4. Monitor sitting comfort

- ## 4.1 Track sitting duration

4.2 Provide gentle reminder

5. Maintain safe posture

5.1 Monitor posture continuously

5.2 Detect slouching

5.3 Provide voice posture cue

6. Assist desk reachability

6.1 Detect frequently used items

6.2 Display reach reminder

7. Manage rest breaks

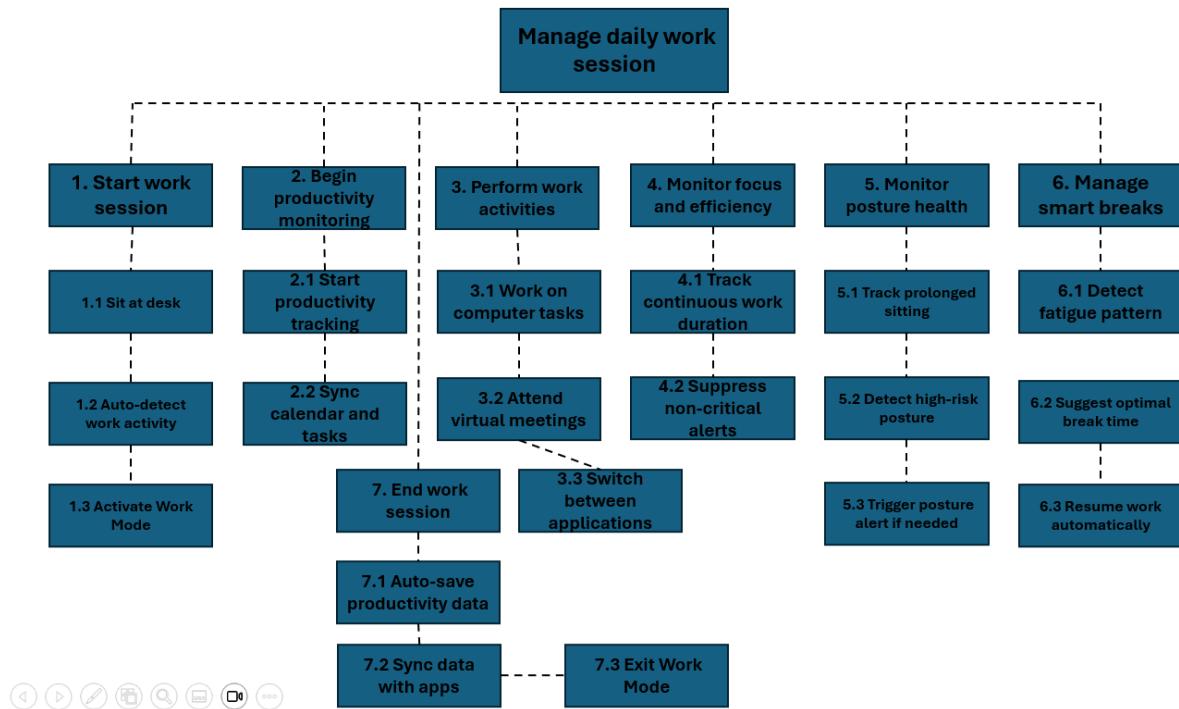
7.1 Suggest rest break

7.2 Wait for user confirmation

8. End desk session

8.1 Save activity summary

8.2 Return to idle mode



2.4.3 User 3: Daniel Lim – Young Busy Professional

0. Manage daily work session

1. Start work session

1.1 Sit at desk

- 1.2 Automatically detect work activity
- 1.3 Activate Work Mode
2. Begin productivity monitoring
 - 2.1 Start productivity tracking
 - 2.2 Sync calendar and task schedule
3. Perform work activities
 - 3.1 Work on computer tasks
 - 3.2 Attend virtual meetings
 - 3.3 Switch between work applications
4. Monitor focus and efficiency
 - 4.1 Track continuous work duration
 - 4.2 Suppress non-critical notifications
5. Monitor posture health
 - 5.1 Track prolonged sitting duration
 - 5.2 Detect high-risk posture
 - 5.3 Trigger posture alert only when necessary
6. Manage smart breaks
 - 6.1 Detect fatigue or overwork pattern
 - 6.2 Suggest optimal break timing
 - 6.3 Resume work automatically
7. End work session
 - 7.1 Automatically save productivity data
 - 7.2 Sync data with connected devices
 - 7.3 Exit Work Mode

2.5 DISCUSSION ON FINDINGS FROM TASK 2

[Manage Daily Work Session and Smart Desk Interaction]

This section discusses the findings derived from the Hierarchical Task Analysis (HTA) for Task 2. The analysis focuses on how different users interact with the Smart Desk Organizer & Productivity Assistant during active desk usage and identifies key usability needs, challenges, and system support requirements.

2.5.1 Adam Farhan – University Student

The findings indicate that Adam requires structured support to maintain focus and healthy study habits during prolonged study sessions. The HTA shows that Adam frequently alternates between reading and writing tasks, which may lead to loss of focus and desk clutter over time. Without external prompts, Adam is likely to overlook posture and break management, increasing physical discomfort and reducing productivity.

The inclusion of focus reminders and break notifications highlights the need for a system that actively guides Adam without interrupting his workflow. Posture monitoring and desk organization reminders are essential in supporting ergonomic awareness and maintaining a conducive study environment. Overall, the findings suggest that Adam benefits most from timely, supportive feedback that encourages consistent study routines.

2.5.2 Daniel Lim – Young Busy Professional

For Daniel, the findings emphasize the importance of automation and minimal disruption. The HTA reveals that Daniel prefers the system to operate in the background while providing meaningful insights only when necessary. Frequent notifications or manual inputs would negatively impact his productivity and workflow.

The ability to suppress non-critical alerts and rely on smart break detection aligns with Daniel's preference for efficiency. Posture alerts triggered only in high-risk situations help maintain physical well-being without unnecessary interruptions. These findings indicate that Daniel requires a system that balances productivity monitoring with autonomy and control.

2.5.3 Encik Roslan – Elderly User

Encik Roslan's findings highlight comfort, safety, and accessibility as primary concerns. The HTA shows that prolonged sitting and poor posture may occur without his awareness, increasing the risk of discomfort or strain. Complex interfaces or frequent prompts may cause confusion or anxiety.

Gentle reminders, voice guidance, and confirmation-based interactions are essential in supporting Encik Roslan's desk activities. The system must prioritize reassurance and simplicity rather than productivity optimization. These findings demonstrate the need for adaptive interaction that respects physical limitations and cognitive comfort.

2.6 REQUIREMENT SPECIFICATION FOR TASK 2

[Manage Daily Work Session and Smart Desk Interaction]

This section defines the functional and non-functional requirements derived from the findings of Task 2. The requirements address the observed user needs, behaviors, and limitations identified through the Hierarchical Task Analysis (HTA) for Adam Farhan, Daniel Lim, and Encik Roslan.

2.6.1 Functional Requirements

FR2.1: Automatic Session Detection and Mode Activation

Description:

The system shall automatically detect when a user begins a desk-based activity and activate the appropriate session mode (Study Mode, Work Mode, or Assistance Mode).

Justification:

HTA findings show that manual session initiation may be overlooked or considered inconvenient, particularly by Daniel Lim and Encik Roslan. Automatic detection ensures seamless transition into active sessions and reduces setup effort, supporting uninterrupted workflow and ease of use.

FR2.2: Focus and Activity Monitoring During Sessions

Description:

The system shall monitor active work or study duration and detect prolonged periods of inactivity or reduced focus.

Justification:

Adam's HTA demonstrates frequent task switching and potential loss of focus during study sessions. Focus monitoring enables timely reminders that help maintain attention without being intrusive.

FR2.3: Ergonomic Posture Monitoring and Feedback

Description:

The system shall continuously monitor user posture and provide corrective alerts when unsafe posture is detected.

Justification:

All personas exhibit prolonged sitting behavior in the HTA. Posture feedback is especially critical for Encik Roslan, who may not notice discomfort early, and for Daniel, who experiences long working hours.

FR2.4: Adaptive Break Reminder System**Description:**

The system shall provide break reminders based on focus intervals, session duration, or detected fatigue patterns.

Justification:

The HTA highlights that users often continue working without adequate breaks. Adaptive reminders support Adam's study pacing, help Daniel prevent burnout, and encourage safe sitting habits for Encik Roslan.

FR2.5: Desk Organization and Reachability Assistance**Description:**

The system shall detect desk clutter or frequently used items placed out of reach and provide appropriate reminders.

Justification:

HTA findings indicate that clutter accumulation affects Adam's study efficiency and that reachability is a safety concern for Encik Roslan. Organization assistance improves usability and reduces unnecessary physical strain.

2.6.2 Non-Functional Requirements**NFR2.1: Non-Intrusive Notification Design****Description:**

System notifications shall be context-aware and avoid interrupting users during critical tasks.

Justification:

Daniel's HTA highlights sensitivity to interruptions. Non-intrusive notifications ensure assistance is helpful without negatively impacting productivity.

NFR2.2: Accessibility and Usability Support

Description:

The system shall support accessibility features such as large text, high-contrast visuals, and optional voice guidance.

Justification:

Encik Roslan's HTA demonstrates the need for interfaces that reduce cognitive and visual strain, improving confidence and independent use.

NFR2.3: Real-Time Responsiveness

Description:

The system shall respond to posture changes, focus loss, and user actions within a short response time.

Justification:

Delayed feedback reduces effectiveness of real-time assistance. Timely responses ensure posture correction and focus reminders are meaningful.

NFR2.4: Automatic Data Logging

Description:

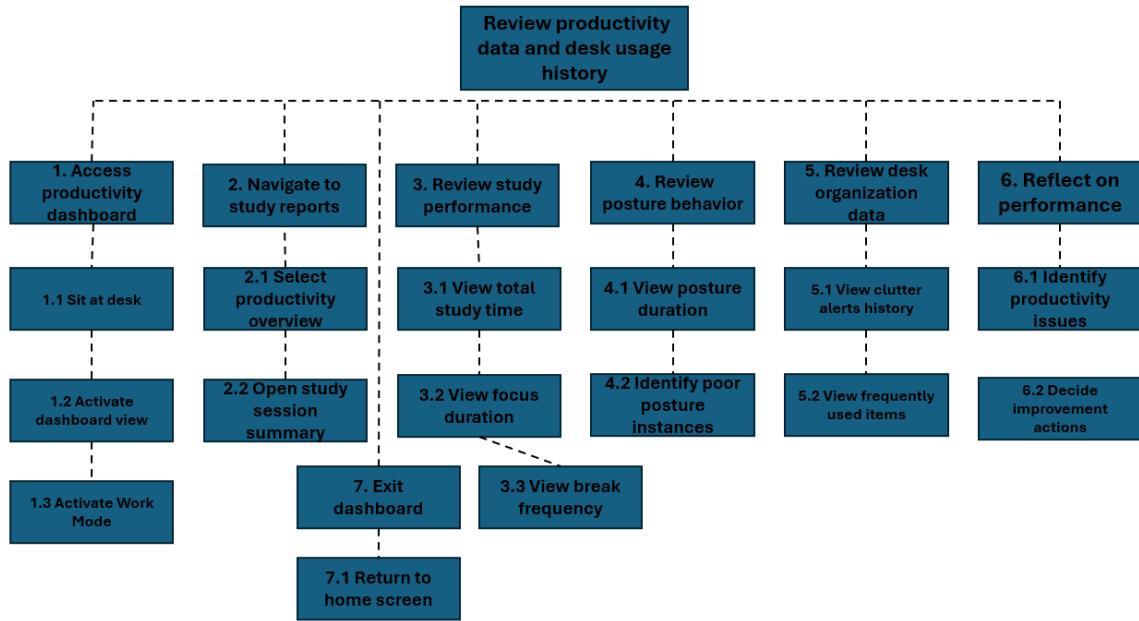
The system shall automatically record session data without requiring manual user input.

Justification:

HTA findings show that users expect session data to be saved seamlessly. Automatic logging supports accurate data collection and reduces user effort.

2.7 HIERARCHY TASK ANALYSIS FOR TASK 3

2.7.1 User 1: Adam Farhan – University Student

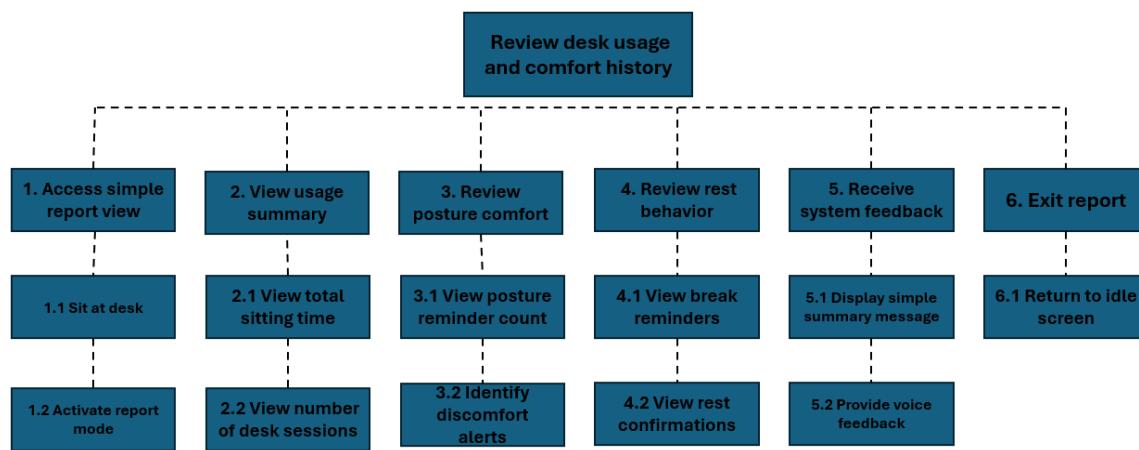


0. Review productivity data and desk usage history

1. Access productivity dashboard
 - 1.1 Sit at desk
 - 1.2 Activate dashboard view
 - 1.3 Activate Work Mode
2. Navigate to study reports
 - 2.1 Select productivity overview
 - 2.2 Open study session summary
3. Review study performance
 - 3.1 View total study time
 - 3.2 View focus duration
 - 3.3 View break frequency
4. Review posture behavior
 - 4.1 View posture duration
 - 4.2 Identify poor posture instances
5. Review desk organization data
 - 5.1 View clutter alerts history
 - 5.2 View frequently used items

6. Reflect on performance
 - 6.1 Identify productivity issues
 - 6.2 Decide improvement actions
7. Exit dashboard
 - 7.1 Return to home screen

2.7.2 User 2: Encik Roslan – Elderly User

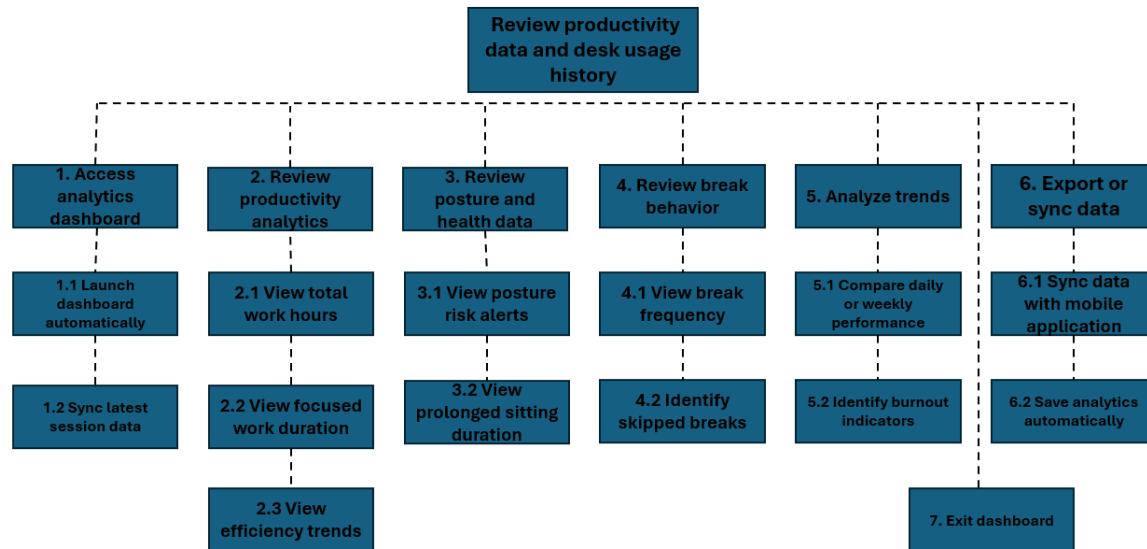


0. Review desk usage and comfort history

1. Access simple report view
 - 1.1 Sit at desk
 - 1.2 Activate report mode
2. View usage summary
 - 2.1 View total sitting time
 - 2.2 View number of desk sessions
3. Review posture comfort
 - 3.1 View posture reminder count
 - 3.2 Identify discomfort alerts
4. Review rest behavior
 - 4.1 View break reminders
 - 4.2 View rest confirmations
5. Receive system feedback
 - 5.1 Display simple summary message
 - 5.2 Provide voice feedback

6. Exit report
 - 6.1 Return to idle screen

2.7.3 User 3: Daniel Lim – Young Busy Professional



0. Review productivity data and desk usage history

1. Access analytics dashboard
 - 1.1 Launch dashboard automatically
 - 1.2 Sync latest session data
 - 2.3 View efficiency trends
2. Review productivity analytics
 - 2.1 View total work hours
 - 2.2 View focused work duration
 - 2.3 View efficiency trends
3. Review posture and health data
 - 3.1 View posture risk alerts
 - 3.2 View prolonged sitting duration
4. Review break behavior
 - 4.1 View break frequency
 - 4.2 Identify skipped breaks

5. Analyze trends
 - 5.1 Compare daily or weekly performance
 - 5.2 Identify burnout indicators
6. Export or sync data
 - 6.1 Sync data with mobile application
 - 6.2 Save analytics automatically
7. Exit dashboard

2.8 DISCUSSION ON FINDINGS FROM TASK 3

[Review Productivity Data and Desk Usage History]

This section discusses the findings derived from the Hierarchical Task Analysis (HTA) for Task 3, which examines how users review productivity information and desk usage history generated by the Smart Desk Organizer & Productivity Assistant. The findings highlight differences in user goals, data interpretation needs, and interaction preferences across the three personas.

2.8.1 Adam Farhan – University Student

The findings indicate that Adam uses productivity data primarily as a reflective tool to evaluate his study habits. The HTA shows that Adam reviews study duration, focus consistency, break frequency, posture behavior, and desk organization patterns. This suggests that Adam benefits from clear visual summaries and progress indicators that help him understand how his behavior affects productivity.

Without structured feedback, Adam may focus only on total study time and overlook important factors such as posture and break management. Therefore, the system must support holistic reflection by presenting interconnected insights rather than isolated metrics.

2.8.2 Daniel Lim – Young Busy Professional

For Daniel, the findings emphasize efficiency and actionable insight. The HTA reveals that Daniel prioritizes trend analysis over detailed session data. Metrics such as focused work duration, posture risk alerts, skipped breaks, and productivity trends are critical for him to identify burnout risks and performance issues.

The findings indicate that Daniel prefers automated data synchronization and minimal interaction when reviewing reports. Overly complex interfaces or excessive explanations would

discourage regular review. Instead, concise dashboards and comparative analytics best support Daniel's decision-making process.

2.8.3 Encik Roslan – Elderly User

Encik Roslan's findings highlight the importance of simplicity and reassurance. The HTA shows that his interaction with productivity data focuses on comfort and safety rather than performance optimization. Metrics such as total sitting time, posture reminders, and rest behavior are sufficient to inform him about his desk usage.

Complex charts or detailed analytics may confuse Encik Roslan and reduce confidence. The findings suggest that the system should provide simplified summaries, clear icons, and voice feedback to ensure information is easily understood and non-threatening.

2.9 REQUIREMENT SPECIFICATION FOR TASK 3

[Review Productivity Data and Desk Usage History]

2.9.1 Functional Requirements

FR3.1: Role-Based Productivity Dashboard Presentation

Description:

The system shall present productivity data and desk usage history differently based on the user profile (student, professional, or elderly user).

Justification:

The findings show that Adam benefits from motivational summaries, Daniel requires analytical trend-based insights, and Encik Roslan needs simplified reassurance-focused feedback. Role-based dashboards ensure relevance and usability for each user group.

FR3.2: Comprehensive Session-Based Data Visualization

Description:

The system shall provide visual summaries of study or work sessions, including focus duration, posture behavior, break frequency, and desk organization patterns.

Justification:

HTA findings indicate that users may overlook important factors such as posture and breaks if

only total session time is shown. Comprehensive visualization supports holistic reflection and informed behavior improvement.

FR3.3: Posture and Break History Tracking

Description:

The system shall allow users to review historical posture alerts and break reminders over multiple sessions.

Justification:

Reviewing recurring posture or break issues helps users identify long-term patterns. This is particularly important for Daniel in preventing burnout and for Encik Roslan in maintaining comfort and safety.

FR3.4: Automatic Data Synchronization and Storage

Description:

The system shall automatically save and synchronize productivity data across connected devices without requiring manual input.

Justification:

HTA findings show that users expect seamless data access. Automatic synchronization reduces effort and ensures data accuracy, especially for busy professionals.

2.9.2 Non-Functional Requirements

NFR3.1: Interface Simplicity and Clarity

Description:

The productivity review interface shall present information clearly using simple layouts, intuitive icons, and minimal text.

Justification:

Encik Roslan's findings demonstrate the need for low cognitive load, while Adam and Daniel also benefit from uncluttered dashboards.

NFR3.2: Fast Data Loading Performance

Description:

Productivity dashboards shall load within a short response time.

Justification:

Slow data retrieval reduces user trust and discourages regular review, particularly for time-sensitive users such as Daniel.

NFR3.3: Supportive and Non-Judgmental Feedback Tone**Description:**

All system feedback messages shall use a positive and supportive tone.

Justification:

Negative or judgmental feedback may discourage Adam and cause anxiety for Encik Roslan. A supportive tone promotes long-term engagement.

NFR3.4: Accessibility Support for Elderly Users**Description:**

The system shall support accessibility features such as large text, high-contrast visuals, and optional voice summaries.

Justification:

HTA findings highlight accessibility as essential for Encik Roslan's ability to understand and trust the system.

3.0 A SET OF ESTABLISHED DESIGN REQUIREMENTS

This section summarizes the final design requirements for the **Smart Desk Organizer & Productivity Assistant**. These requirements are derived from the task analysis, findings, and requirement specifications discussed in earlier sections. They represent the essential system features and qualities needed to support users effectively during desk-based activities.

The design requirements are based on the needs of three user groups: a university student, a young working professional, and an elderly user. The system is designed to improve productivity, support ergonomic comfort, and ensure accessibility while remaining easy to use.

3.1 Functional Design Requirements (with Justification)

The system shall support **personalized user profiles** that allow users to set preferences related to study or work duration, posture monitoring, break reminders, and desk organization.

This is necessary because Task 1 showed that users have different habits and comfort needs, and personalization allows the system to adapt to each individual.

The system shall **automatically detect desk usage sessions** and activate the appropriate mode, such as Study Mode, Work Mode, or Assistance Mode.

This requirement is justified by Task 2 findings, where users may forget or prefer not to manually start a session, especially busy professionals and elderly users.

The system shall provide **focus and activity monitoring** during active sessions.

This is required because Task 2 revealed that students often lose focus during long study periods, while professionals may work continuously without noticing fatigue.

The system shall **monitor user posture and provide corrective feedback** when poor posture is detected.

This requirement is justified by the HTA findings that show users frequently maintain unhealthy posture during prolonged desk usage.

The system shall provide **adaptive break reminders** based on session duration or user behavior. Task 2 showed that users often forget to take breaks, which may lead to discomfort or reduced productivity.

The system shall assist users in **maintaining desk organization and item reachability**.

This is justified by findings showing that clutter affects student productivity and that reachability is important for elderly user safety.

The system shall **automatically record and store session data**, including productivity time, posture behavior, and break history.

This requirement ensures that users can review their desk usage without manual input, as expected in Task 3.

The system shall present **role-based productivity dashboards** that adapt information complexity to the user profile.

This is necessary because Task 3 showed that students, professionals, and elderly users interpret productivity data differently.

3.2 Non-Functional Design Requirements

The system shall provide a **simple and easy-to-use interface** that minimizes cognitive load.

This is especially important for elderly users, as identified in Tasks 1 and 3.

The system shall ensure **non-intrusive notifications** during active sessions.

Task 2 findings show that frequent or poorly timed alerts can disrupt work, particularly for professionals.

The system shall support **accessibility features**, such as large text, high-contrast displays, and voice guidance.

This requirement is justified by the needs of elderly users identified in the HTA.

The system shall respond to user actions and posture changes in **near real time**.

Immediate feedback is important for effective posture correction and focus support.

The system shall use a **positive and supportive feedback tone**.

Task findings indicate that negative feedback may reduce motivation or cause anxiety, especially for students and elderly users.

The system shall ensure **reliable operation and automatic data saving**.

Users expect the system to function consistently without requiring repeated manual actions.

3.3 Summary

The established design requirements ensure that the Smart Desk Organizer & Productivity Assistant supports productivity, physical well-being, and accessibility across different user groups. These requirements are directly based on task analysis findings and provide a clear foundation for future system design and prototyping.

SCSV 2113

HUMAN COMPUTER INTERACTION

(Session 2024/2025 Semester 2)

Faculty of Computing
Universiti Teknologi Malaysia

P3 – CONCEPTUAL & PHYSICAL DESIGN

[Project Title: Smart Desk Organizer & Productivity Assistant]

LECTURER

NOR ANITA FAIROS BINTI ISMAIL

(Session 2025/2026 Semester 1)

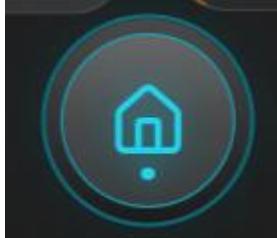
Faculty of Computing Universiti Teknologi Malaysia

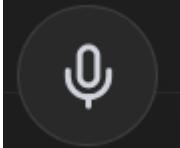
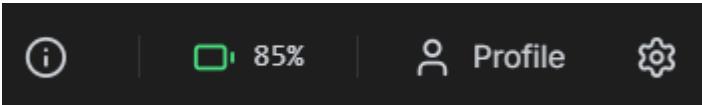
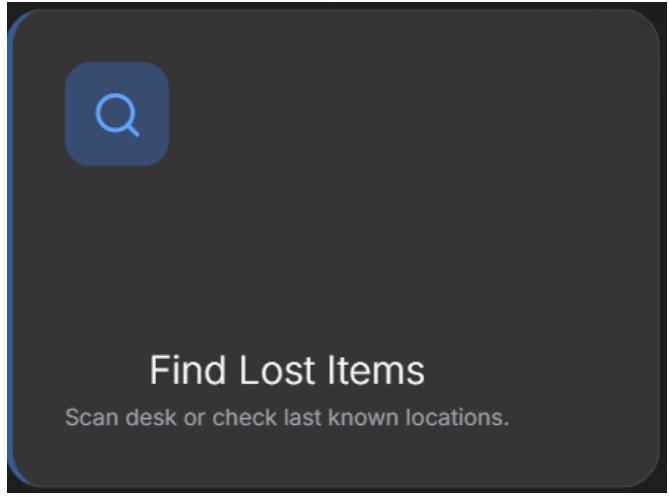
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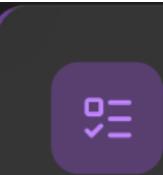
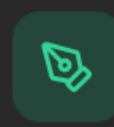
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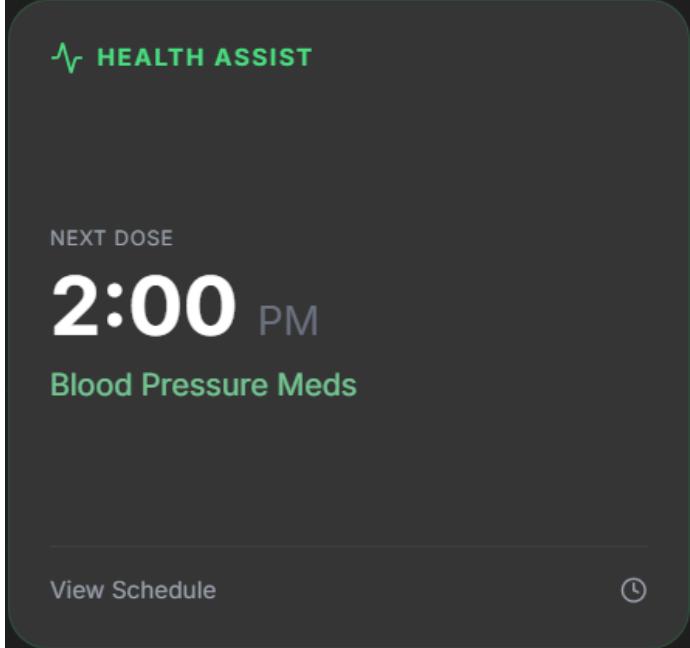
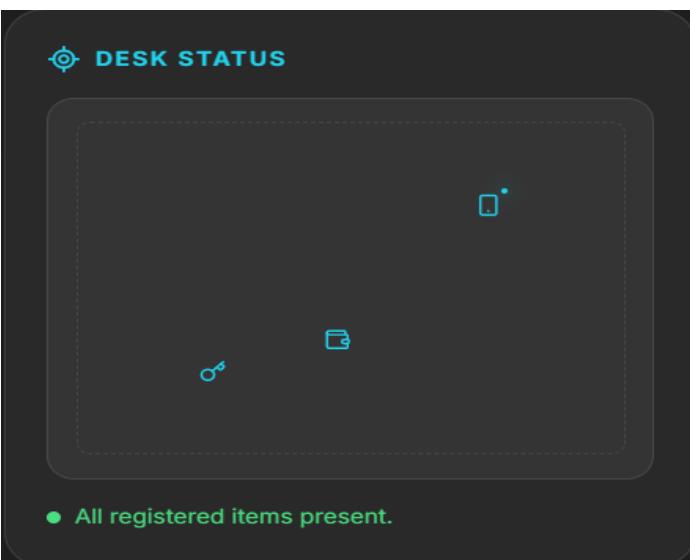
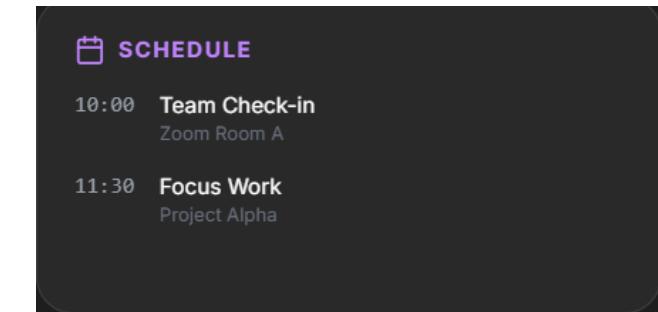
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MUHAMMAD THAQIF BIN ABDUL AZIZ	SX231702ECJHF04
PUTRA NAZREEN HAFIZ BIN ABDUL KARIM	SX240247ECJHS04

1.0 Interface Metaphor

No.	Metaphor	Description and Justification
1.	 <p>The interface is titled "System Visual Guide: Understanding the color language of your Smart Desk." It displays six color-coded categories with corresponding icons and descriptions:</p> <ul style="list-style-type: none"> Interaction Cyan: The primary system color. Used for navigation, buttons, and active scanning states. Wellness Green: Health and safety. Indicates medications taken, "found" items, and stable vital signs. Warning Amber: Attention required. Marks missing items, pending deadlines, or minor health warnings. Critical Red: Immediate focus. Used for critical heart alerts, active wall projections, and system errors. Focus Purple: Deep work. Dedicated to your schedule, focus mode timer, and AI productivity insights. Creative Emerald: Idea space. Used for the notebook gallery, digital ink, and handwriting conversion. <p>A blue "I UNDERSTAND" button is at the bottom.</p>	<p>System Visual Guide (Color Language)</p> <p>Description: The Smart Desk prototype implements a standardized color-coded visual language across all interface screens to convey system status, categorize information, and guide user interaction.</p> <p>Justification: This structured color language was designed to minimize cognitive load and enable rapid information retrieval. In a complex environment combining physical items, digital tasks, and health monitoring, users need to assess status "at a glance." By consistently applying semantic meaning to color, the system allows users to instantly distinguish between a critical health alert (Red) and a standard work reminder (Purple) without needing to read detailed text. This distinct categorization helps build strong mental models, ensuring intuitive navigation and preventing alert fatigue by clearly separating urgent warnings from informational updates.</p>
2.		<p>Home Icon</p> <p>Description: A circular button featuring a house/desk silhouette located at the bottom center of every screen.</p> <p>Justification: The house icon is the universal digital standard for "Return to Dashboard." Its consistent placement at the bottom center provides a "safety net" for navigation, ensuring users can always reset their journey regardless of which</p>

		sub-menu they are in.
3.	 A circular icon containing a white microphone symbol, positioned at the top center of the interface.	<p>Voice Assistant (Microphone)</p> <p>Description: A microphone symbol positioned at the top center of the interface.</p> <p>Justification: The microphone is a globally recognized metaphor for voice interaction and recording. Placing it at the top center designates it as a primary, system-wide utility, allowing for hands-free control of the desk's smart features without cluttering the main navigation tiles.</p>
4.	 A dark horizontal bar containing several icons: a blue circle with an 'i', a battery icon showing 85%, a person icon labeled 'Profile', and a gear icon.	<p>Settings (Gear)</p> <p>Description: A standard gear icon located in the top-right utility bar.</p> <p>Justification: The gear is the conventional symbol for system configuration and preferences. Using this metaphor allows users to immediately identify where to adjust hardware settings such as gesture sensitivity or Bluetooth connections without needing text labels.</p>
5.	 A dark rectangular tile titled "Find Lost Items" with a blue magnifying glass icon. Below the title, the text "Scan desk or check last known locations." is visible.	<p>Search (Magnifying Glass)</p> <p>Description: A magnifying glass icon used for the "Find Lost Items" tile.</p> <p>Justification: The magnifying glass is the standard metaphor for "seeking" or "finding" information. In this context, it effectively communicates the tool's purpose: scanning the physical desk surface to locate missing belongings.</p>

6.	 <p>Manage Tasks</p> <p>View daily goals and set alerts.</p>	<p>Manage Tasks (Checklist)</p> <p>Description: A list icon with checkmarks used for the productivity hub.</p> <p>Justification: The checklist metaphor directly represents organization, goal tracking, and completion. This visual cue helps users mentally categorize this section as a place for active workflow management and schedule adherence.</p>
7.	 <p>Quick Notes</p> <p>Use stylus on touchscreen surface.</p>	<p>Quick Notes (Pen Nib)</p> <p>Description: A fountain pen nib icon used for the digital handwriting interface.</p> <p>Justification: The pen nib is a classical metaphor for writing and creativity. It distinguishes the stylus-based "Idea Space" from standard keyboard-based task management, signaling to the user that this area is optimized for digital ink and sketching.</p>
8.	 <p>Cast Content</p> <p>Project schedule or documents.</p>	<p>Cast Content (Projector)</p> <p>Description: A stylized projector symbol used for the projection management screen.</p> <p>Justification: This icon provides a literal representation of the desk's unique hardware capability. It informs the user that this section controls the output of digital content like calendars or notes onto physical surfaces.</p>

9.	 <p>The interface shows a dark-themed card with a green heart icon and the text "HEALTH ASSIST". Below it, "NEXT DOSE" is displayed above a large white digital clock showing "2:00 PM". Underneath the clock is the text "Blood Pressure Meds". At the bottom left is a "View Schedule" button, and at the bottom right is a small clock icon.</p>	<p>Health Assist (Heart)</p> <p>Description: A heart symbol used for the Wellness Center and real-time vital monitoring.</p> <p>Justification: The heart is the universal symbol for biological health and life. Using this metaphor for the Health Assist center makes it immediately clear that the section is dedicated to monitoring vitals, pulse rate, and medication schedules.</p>
10.	 <p>The interface shows a dark-themed card with a blue crosshair icon and the text "DESK STATUS". It features a large dashed rectangular area representing a desk surface. Inside this area, there are three small icons: a blue square, a blue circle, and a blue triangle. At the bottom left, a green circular bullet point is followed by the text "All registered items present."</p>	<p>Desk Status</p> <p>Description: A stylized target/crosshair icon used for the "Desk Status" widget.</p> <p>Justification: The crosshair metaphor represents "pinpointing" or "locating." It communicates that this section is dedicated to the precise spatial monitoring of the desk surface and the real-time tracking of registered physical items.</p>
11.	 <p>The interface shows a dark-themed card with a purple calendar icon and the text "SCHEDULE". It lists two events: "10:00 Team Check-in" in "Zoom Room A" and "11:30 Focus Work" in "Project Alpha".</p>	<p>Schedule</p> <p>Description: A calendar icon used to identify the daily event list.</p> <p>Justification: A calendar is the standard metaphor for time management and chronological planning. This helps users quickly distinguish their timed events (like meetings) from their ongoing general tasks.</p>

2.0 Storyboard Hand Sketching

The storyboard hand sketches illustrate real-world scenarios in which users interact with the **Smart Desk Organizer & Productivity Assist**, using a visual narrative approach common in UX design to communicate user journeys and product value. In UX practice, storyboards help teams and stakeholders visualize how people encounter and use a product through sequential drawings paired with contextual captions, effectively mapping the user's actions, environment, and emotional responses — a technique that enhances empathy and shared understanding among designers and developers.

These storyboard panels focus on key SmartDesk interactions such as **smart item checking**, **reminders**, **Focus Mode**, and **assisted organization**, each framed as part of a user's daily routine. By depicting diverse user personas—including students, working professionals, and elderly users—the sketches demonstrate how the SmartDesk adapts to different needs and contexts, making abstract product features more concrete and easier to evaluate early in the design process. In UX design, this visual narrative method not only clarifies user goals and pain points but also supports iterative refinement of features before development, ensuring the product remains user-centered and intuitive.

2.1 Task 1: Smart Item Checking Before Leaving (Mariah – Student)



Panel 1:

Mariah, a university student, is about to leave and checks her phone. The smart desk system sends a notification showing that one essential item is missing.

Panel 2:

The phone screen displays an alert saying “1 item missing – Wallet,” warning Mariah before she leaves.

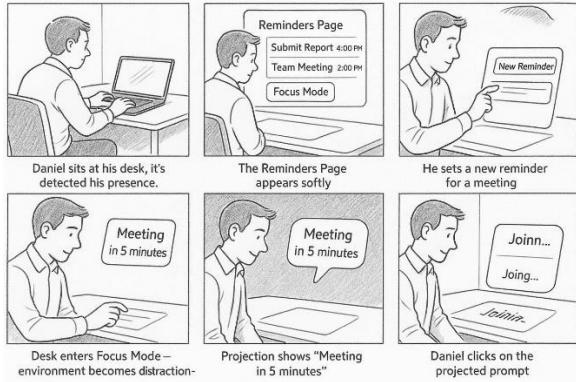
Panel 3:

The item tracker checklist appears, showing essential items such as keys, student ID, and wallet.

Panel 4:

Once all items are detected, the system confirms that all essential items are present. Mariah feels relieved and confident before leaving.

2.2 Task 2: Smart Desk Reminders and Focus Mode (Jamal – Working Professional)



Panel 1:

Jamal, a working professional, sits at his smart desk. The system detects his presence and activates automatically.

Panel 2:

A reminders page appears softly on the desk surface, showing upcoming tasks such as meetings and deadlines.

Panel 3:

Jamal sets a new reminder for a meeting using the smart desk interface.

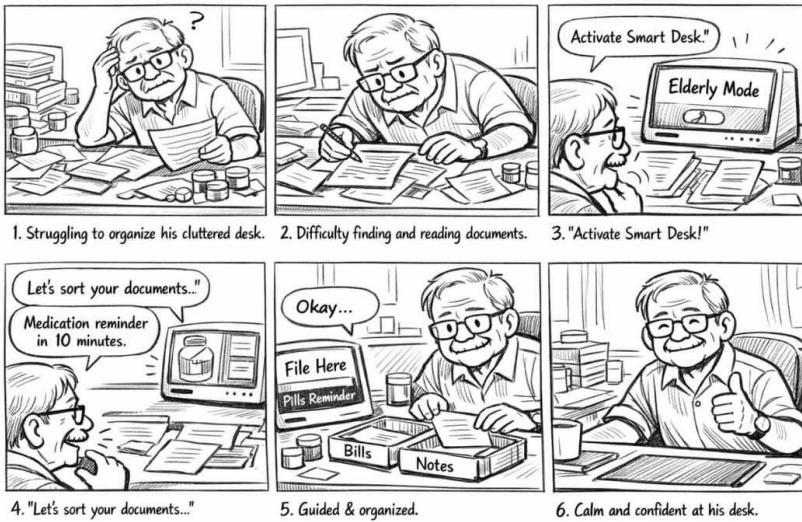
Panel 4:

As the meeting time approaches, the desk enters focus mode and projects a message saying “Meeting in 5 minutes.”

Panel 5:

Jamal taps the projected prompt to join the meeting directly, allowing him to stay focused and on time.

2.3 Task 3: Assisted Organization and Progress Confidence (Karim – Elderly User)



Panel 1:

Karim, an elderly user, sits at a cluttered desk and looks confused while trying to manage documents and medication.

Panel 2:

Karim activates the smart desk using a voice command, and the system switches to “Elderly Mode” with a clearer and simpler display.

Panel 3:

The smart desk guides Karim step by step, suggesting how to sort documents and displaying a medication reminder.

Panel 4:

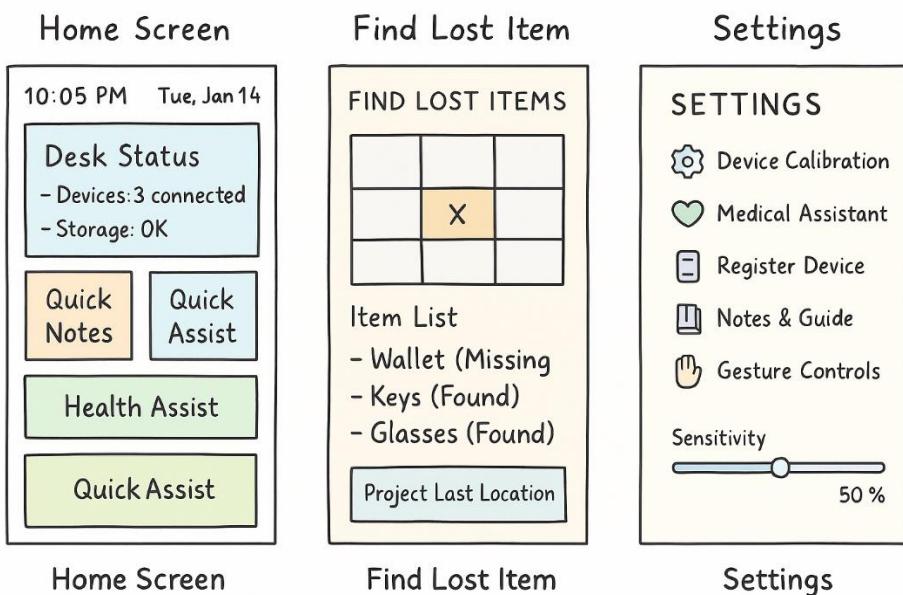
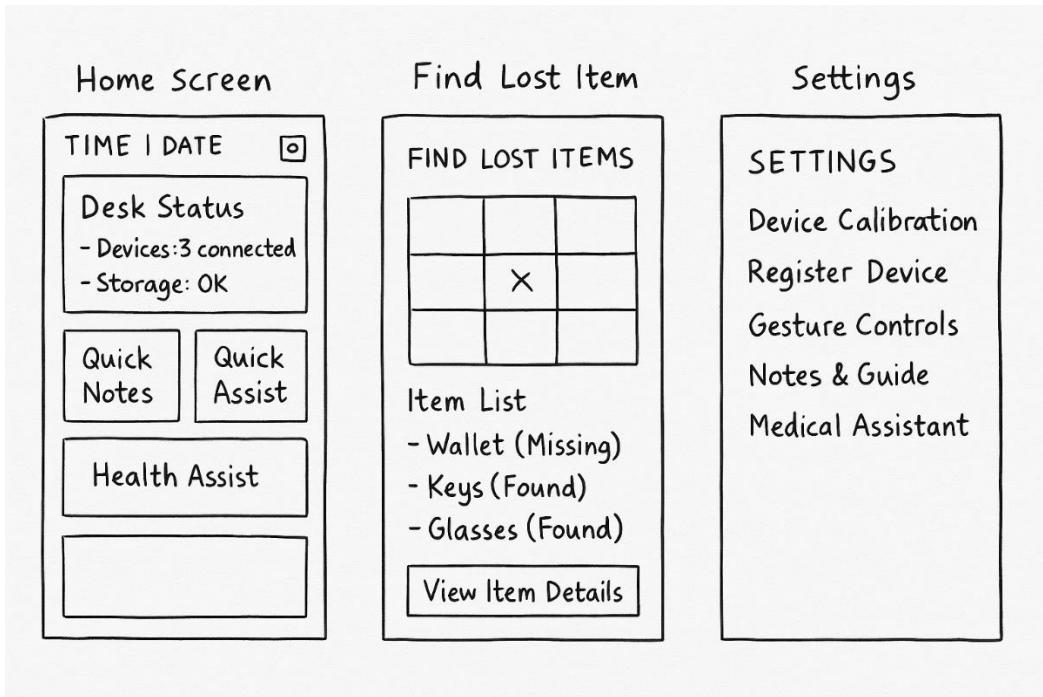
Labeled sections such as “Bills,” “Notes,” and “Files” appear, helping Karim organize his items easily.

Panel 5:

The desk becomes neat and organized. Karim feels calm, confident, and satisfied after completing the task.

3.0 Layout Screen Design – Low Fidelity Prototype (LFP)

3.1 Interface layout task 1



Design Justification for Smart Desk Interface — Stage 1 (Sketch-Level Design)

Gestalt Principles

1. Proximity

Even in its early form, the layout groups related elements to support user understanding.

- The Home Screen places core widgets like “Find Lost Items,” “Manage Tasks,” and “Health Assist” in separate rows, helping users mentally separate functions.
- The Settings screen lists configuration options in a single vertical column, reinforcing their shared purpose.

2. Similarity

Uniform shapes and text formatting create early visual consistency.

- All buttons and panels use rectangular boxes with similar dimensions.
- Labels are written in consistent font size and alignment, helping users recognize repeated patterns.

3. Continuity

The layout supports a basic but logical navigation flow.

- The Home Screen flows from top (time/date) to bottom (task tools), guiding users through system status and productivity features.
- The Find Lost Item screen moves from map → item list → action button, matching the natural search process.

4. Figure and Ground

Basic spacing and alignment help distinguish content from background.

- **Each module is enclosed in a box, separating it from surrounding elements.**
- **The “X” marker in the desk map stands out as a focal point, guiding user attention.**

5. Closure

Each screen presents a complete, self-contained task.

- The Find Lost Item screen includes all necessary components: map, item list, and action button.
- The Settings screen lists all options clearly, giving users a sense of completion per section.

Shneiderman’s Eight Golden Rules

1. Strive for Consistency

- Button shapes, layout structure, and labelling style are consistent across all screens.
- The same vertical stacking logic is applied to both dashboard and settings.

2. Enable Frequent Users to Use Shortcuts

- Users can access “Find Lost Items” or “Health Assist” directly from the Home Screen.
- The “View Item Details” button offers a shortcut to deeper information.

3. Offer Informative Feedback

- Item status labels like “Missing” and “Found” provide basic feedback.
- The desk map visually indicates item location with an “X” marker.

4. Design Dialogs to Yield Closure

- Buttons like “View Item Details” signal the end of a search task.
- Each screen is structured to guide users toward a clear action.

5. Offer Error Prevention

- Simple labels and separation of input areas reduce confusion.
- The item list helps users avoid searching for already found objects.

6. Permit Easy Reversal of Actions

- Users can revisit the Home Screen or reselect items without restarting.
- The modular layout allows flexible navigation.

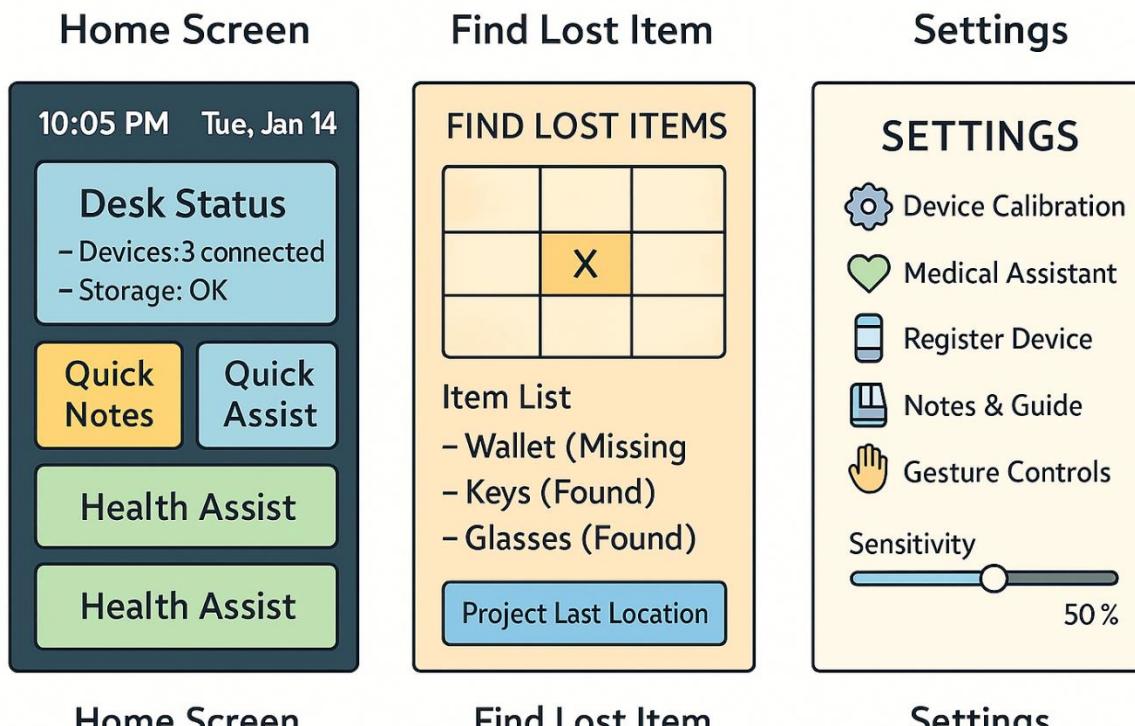
7. Support Internal Locus of Control

- Users choose which module to enter and what actions to take.
- The system layout responds to user decisions, even in its early form.

8. Reduce Short-Term Memory Load

- Each screen focuses on one task:
 - Home → overview
 - Find Lost Item → locate objects
 - Settings → configure system
- Users don’t need to remember previous steps; each module is self-contained.

3.2 Interface layout task 2



Design Justification for Smart Desk Interface — Stage 2 (Mid-Fidelity Design)

Gestalt Principles

1. Proximity

Elements are grouped to reflect their functional relationships.

- On the Home Screen, widgets like “Quick Notes,” “Quick Assist,” and “Health Assist” are stacked vertically, helping users mentally separate productivity tools from wellness tools.
- In the Settings screen, configuration options like “Device Calibration,” “Gesture Controls,” and “Medical Assistant” are listed together, reinforcing their shared purpose.

2. Similarity

Basic colour coding and button shapes create visual consistency.

- All tiles use rounded rectangles with similar dimensions and layout.

- Icons and labels follow a uniform style, helping users recognize repeated patterns across modules.

3. Continuity

The layout supports a natural flow of interaction.

- The Home Screen flows top-to-bottom, starting with system status and ending with health tools.
- The Find Lost Item screen guides users from desk map → item list → action button, matching their mental model of search and recovery.
- The Settings screen flows from top to bottom, ending with a sensitivity slider for gesture control.

4. Figure and Ground

Colour contrast and spacing help distinguish interactive elements.

- Buttons like “Project Last Location” and “Health Assist” stand out against neutral backgrounds.
- The “X” marker in the desk map is clearly visible, guiding user attention to the missing item.

5. Closure

Each screen presents a complete, self-contained task.

- The Find Lost Item screen includes all necessary components: map, item list, and action button.
- The Settings screen uses a vertical stack of labelled options and a slider, giving users a clear sense of completion per section.

Shneiderman's Eight Golden Rules

1. Strive for Consistency

- Button shapes, icon styles, and tile layouts are reused across screens.
- Colour meanings (e.g., Amber for alerts, Green for health) are introduced and applied consistently.

2. Enable Frequent Users to Use Shortcuts

- Users can access “Find Lost Items” or “Health Assist” directly from the dashboard.
- The “Project Last Location” button offers a fast way to locate missing items.

3. Offer Informative Feedback

- Item status indicators (e.g., “Missing,” “Found”) are color-coded and icon supported.
- Health tiles show upcoming medication times and vitals like heart rate.

4. Design Dialogs to Yield Closure

- Buttons like “Project Last Location” and “Mark as Found” signal task completion.
- Each tile leads to a focused module with a clear endpoint.

5. Offer Error Prevention

- Settings are labelled clearly (e.g., “Gesture Controls,” “Device Calibration”), reducing confusion.
- The item list in Find Lost Item helps users avoid searching for already found objects.

6. Permit Easy Reversal of Actions

- Users can toggle gesture sensitivity or reselect items without restarting.
- Manual logs in Health Assist allow corrections.

7. Support Internal Locus of Control

- Users choose which module to enter and what actions to take.
- The system responds to their inputs, reinforcing autonomy.

8. Reduce Short-Term Memory Load

- Each screen focuses on one task:
 - Home → overview
 - Find Lost Item → locate objects
 - Settings → configure system
- Users don’t need to remember previous steps; each module is self-contained.

3.3 Interface layout task 3

The image displays three screenshots of a mobile application interface for a "Smart Desk".

Top Screenshot: System Visual Guide

This screen shows a color-coded visual guide with six categories:

- Interaction Cyan**: Primary system color, used for navigation, buttons, and active scanning states.
- Wellness Green**: Health and safety, indicates medications taken, "found" items, and stable vital signs.
- Warning Amber**: Attention required, marks missing items, pending deadlines, or minor health warnings.
- Critical Red**: Immediate focus, used for critical heart events, active wall projections, and system errors.
- Focus Purple**: Deep work, dedicated to your activities, focus mode timer, and AI productivity insights.
- Creative Emerald**: Open space, used for the notebook gallery, digital ink, and handwriting conversion.

A blue "UNDERSTAND" button is at the bottom.

Middle Screenshot: Home Screen

This screen displays various cards:

- DESK STATUS**: Shows a green icon and a note: "All registered items present."
- SCHEDULE**: Shows events: "10:00 Team Check-in Zoom Room A" and "11:30 Focus Work Project Alpha".
- Find Lost Items**: Scan desk or check last known locations.
- Manage Tasks**: View daily goals and set alerts.
- Quick Notes**: Use stylus on touchscreen surface.
- Cast Content**: Project schedule or documents.
- HEALTH ASSIST**: Displays "NEXT DOSE 2:00 PM Blood Pressure Meds" and "View Schedule". It also shows "Heart Rate 72 bpm" and "Sitting Time 45 mins".

A central circular navigation button with a house icon is at the bottom center.

Bottom Screenshot: Settings Screen

This screen shows the following sections:

- DESK STATUS**: Firmware v2.4.0 (Stable), Last Sync 2 mins ago, Storage 45% Used.
- Settings**: Gesture Controls, Voice Assistant, Register Items, Integrations, Help & Guide.
- Hand Tracking**: Gestures: Swipe L/R (Switch Screens), Open Palm (Pause Media), Pinch Air (Zoom View). Sensitivity slider at 50%.
- CONNECTED**: Galaxy Watch (Not Connected) and Pixel B Pro (Active).

A central circular navigation button with a house icon is at the bottom center.

Design Justification for Smart Desk Interface

Gestalt Principles

1. Proximity

Elements that belong together are visually grouped.

- In the dashboard, widgets like “Find Lost Items,” “Manage Tasks,” and “Health Assist” are placed in distinct panels, helping users process each function as a separate unit.
- In the settings screen, gesture controls and calibration options are grouped under the “Settings” panel, reinforcing their functional relationship.

2. Similarity

Consistent use of shapes, colors, and icon styles creates visual harmony.

- The System Visual Guide uses uniform card layouts and color-coded categories (e.g., Interaction Cyan, Wellness Green) to help users quickly recognize meaning.
- Buttons like “I UNDERSTAND” and icons across screens follow the same design language, reinforcing familiarity.

3. Continuity

The layout supports smooth navigation and visual flow.

- The dashboard flows from top (status bar) to bottom (task panels), guiding users naturally through system status, productivity, and health.
- The settings interface flows left to right: device status → settings options → gesture controls, matching users’ expectations of progressive configuration.

4. Figure and Ground

Clear contrast separates interactive elements from background visuals.

- Bright colors (Amber, Red, Cyan) are used for alerts and buttons, standing out against neutral backgrounds.
- Health metrics and system status icons are placed on clean panels, making them easy to identify.

5. Closure

Each screen feels complete and self-contained.

- The System Visual Guide uses boxed color definitions and a closing button (“I UNDERSTAND”) to signal completion.
- The dashboard and settings panels are enclosed in clear boundaries, helping users feel confident about where each function begins and ends.

Shneiderman's Eight Golden Rules

1. Strive for Consistency

- Typography, iconography, button shapes, and color meanings are consistent across all screens.
- The same layout logic applies to both dashboard and settings, reducing user confusion.

2. Enable Frequent Users to Use Shortcuts

- Users can jump directly to “Find Lost Items,” “Health Assist,” or “Cast Content” from the dashboard.
- Gesture controls offer fast interaction without navigating menus.

3. Offer Informative Feedback

- Status indicators (e.g., “CONNECTED,” “Group Status”) and health metrics (e.g., 72 bpm, 120/80) provide real-time feedback.
- Color-coded alerts (Amber for warnings, Red for critical) help users understand system state instantly.

4. Design Dialogs to Yield Closure

- Buttons like “I UNDERSTAND,” “Mark as Found,” and “End Focus Mode” signal task completion.
- Each module (e.g., Health Assist, Gesture Settings) ends with a clear action or confirmation.

5. Offer Error Prevention

- Settings are grouped and labeled clearly (e.g., “Device Calibration,” “Register Device”), reducing misconfiguration.
- Health alerts and item tracking prevent users from overlooking critical tasks.

6. Permit Easy Reversal of Actions

- Users can toggle gesture sensitivity, switch between settings, or reconfigure devices without restarting.
- “Mark as Found” and manual log entries allow corrections.

7. Support Internal Locus of Control

- Users choose what to track, what to project, and how to interact (touch, gesture, voice).
- The system responds to user decisions, reinforcing a sense of control.

8. Reduce Short-Term Memory Load

- Each screen focuses on one task:
 - Dashboard → overview
 - Settings → configuration
 - Visual Guide → color meanings
- Users don't need to remember previous steps; everything is visible and contextual.

3.4 Justification of Interface Design

The interface design of the Smart Desk Organizer & Productivity Assistant was developed with usability and user understanding as the main priorities. To ensure the system is easy to use and visually clear, several Human–Computer Interaction (HCI) principles were applied. In particular, Gestalt principles and Shneiderman's Eight Golden Rules were used to guide layout decisions, interaction flow, and feedback design.

3.4.1 Application of Gestalt Principles

Gestalt principles were used to help users quickly understand how different interface elements are related, without requiring additional explanation.

Proximity

Elements that serve the same purpose are placed close together. For example, in the task management screen, task names, priority labels, and focus controls are grouped in the same area. This helps users immediately recognise that these elements belong to one task.

Similarity

Similar functions are designed with consistent colours, icons, and button styles. Health-related features use green tones, while productivity tools use a consistent visual style across screens. This consistency allows users to predict how the system will behave.

Figure Ground

Important information such as alerts, timers, and missing item warnings stands out clearly from the background. This makes it easier for users to focus on key actions without being distracted by less important content.

Continuity

The layout structure is kept consistent when users move between different screens. Navigation follows a simple and logical flow from the home screen to other features, reducing confusion and making the system easier to learn.

3.4.2 Application of Shneiderman's Eight Golden Rules

The design also follows Shneiderman's Eight Golden Rules to support smooth interaction and reduce user errors.

Consistency

The same layout patterns, icons, and colour meanings are used throughout the system. This helps users feel familiar with the interface after only a short time of use.

Shortcuts for Frequent Users

Users who regularly use the system can quickly access features such as Focus Mode or task reminders without navigating through multiple screens.

Informative Feedback

The system provides clear visual feedback for every action. For example, when a focus session starts or an item is found, the interface immediately updates to show the current status.

Clear Task Completion

Each action has a clear ending, such as completing a task or finishing a focus session. This gives users a sense of progress and achievement.

Error Prevention

To avoid mistakes, important actions such as ending Focus Mode require additional confirmation. This prevents users from accidentally stopping their work session.

Easy Recovery from Errors

Users are allowed to edit or undo actions, such as modifying tasks or adding manual health records, reducing stress when mistakes occur.

User Control

The system responds only when users choose to interact with it. Users decide when to start tasks, check health data, or project content, giving them full control over the system.

Reduced Memory Load

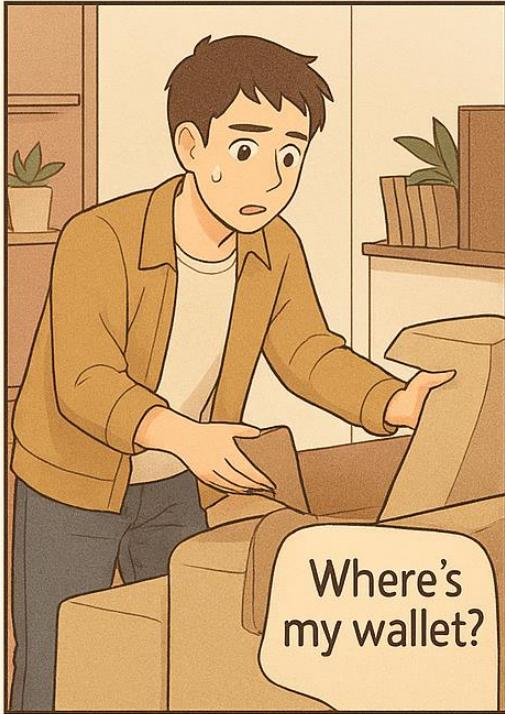
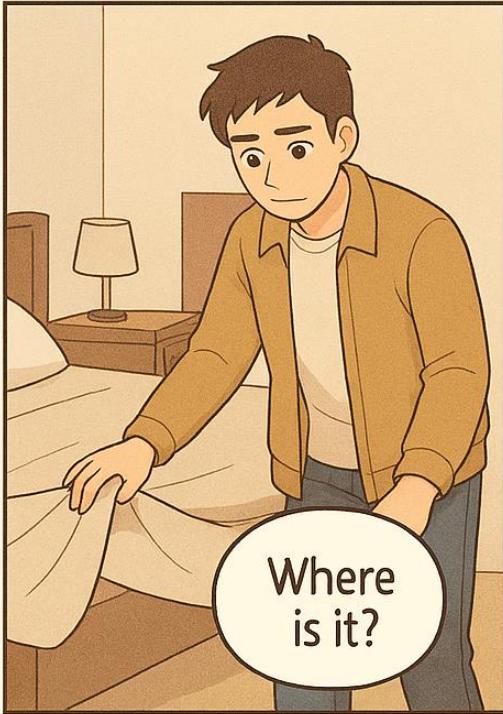
Information is displayed clearly using dashboards, icons, and simple labels, so users do not need to remember instructions or previous steps.

4.0 Storyboard Video Recording

THE FORGOTTEN MEDICINE



THE LOST WALLET



4.1 Summary of Project Idea and Brainstorming

The Smart Desk project was developed to address common productivity and wellness challenges faced by students, professionals, and elderly users. During the brainstorming phase, the team identified recurring issues such as misplaced items, forgotten medication, workspace clutter, and difficulty maintaining focus.

These insights guided the creation of a smart workspace equipped with:

- A touchscreen dashboard
- Item-tracking sensors
- Health monitoring tools
- AI-powered task management
- Projection and casting features
- Gesture and voice controls

The interface was intentionally designed to be modular, clean, and intuitive. The two storyboard scenarios were selected because they represent realistic, everyday problems that the Smart Desk can solve effectively.

4.2 Demonstration Video Link

Video Link:

<https://youtu.be/f6MFU7HzL8>

4.3 Explanation of Interface Use Across All Personas (Based on Storyboard Situations)

The Smart Desk interface is designed to support a wide range of users — students, professionals, elderly users, and accessibility-focused users. The two storyboard situations demonstrate how each persona interacts with the system during real-life tasks.

Situation 1: Forgetting Medicine — Health Assist Interface

Scenario Summary

The user prepares to leave the house but suddenly realizes they forgot to take their medication. The Smart Desk detects this through the **Health Assist** module and displays a reminder.

How Different Personas Use This Interface

- **Students**

Students with busy schedules often forget small tasks.

The Health Assist interface helps them by providing:

- Clear medication reminders
- Countdown timers
- Color-coded alerts (Wellness Green / Warning Amber)

- **Working Professionals**

Professionals juggling meetings benefit from:

- Automatic medication alerts
- Quick “Taken / Not Taken” status
- Smartwatch integration for reminders

- **Elderly Users**

Elderly users rely on:

- Large, readable icons
- Simple “Take Now” buttons
- Real-time vitals monitoring

This reduces the risk of missed medication.

- **Accessibility-Focused Users**

Users with mobility or visual challenges can use:

- Voice commands (“Smart Desk, did I take my medicine”)
- Gesture controls to confirm medication
- High-contrast color alerts

Situation 2: Lost Wallet — Find Lost Items Interface

Scenario Summary

The user searches the bedroom, living room, and TV room for a missing wallet. The Smart Desk uses the **Find Lost Items** module to locate the wallet and display its last known position.

How Different Personas Use This Interface

- **Students**

Students often misplace items during hectic routines.

The Desk Inventory Map helps them:

- Identify missing items
- View last scanned location
- Use “Project Last Location” to highlight the spot on the desk

- **Working Professionals**

Professionals frequently misplace access cards, keys, or wallets.

The interface provides:

- Instant “MISSING” alerts
- A sidebar list of all registered items
- A precise location map

- **Elderly Users**

Elderly users benefit from:

- Clear item status indicators
- Simple “Mark as Found” buttons
- Visual projection on the desk surface

- **Accessibility-Focused Users**

Users with physical or visual limitations can rely on:

- Voice commands (“Find my wallet”)
- Audible alerts
- High-contrast item markers

SCSV 2113

HUMAN COMPUTER INTERACTION

(Session 2024/2025 Semester 2)

Faculty of Computing
Universiti Teknologi Malaysia

P4 – PROTOTYPE & EVALUATION

[Project Title: Smart Desk Organizer & Productivity Assistant]

LECTURER

NOR ANITA FAIROS BINTI ISMAIL

(Session 2025/2026 Semester 1)

Faculty of Computing Universiti Teknologi Malaysia

GROUP NO 3 (SDO)

Prepared by

MUHAMMAD SYAFIQ BIN AB RAZAK	SX240659ECJHS04
MUHAMMAD BADRUL HISYAM BIN MAT ROSLI	SX231719ECJHF04
MUHAMMAD SYAZWAN BIN KAMARUZAMAN	SX240290ECRHS04
MUHAMMAD THAQIF BIN ABDUL AZIZ	SX231702ECJHF04
PUTRA NAZREEN HAFIZ BIN ABDUL KARIM	SX240247ECJHS04

1.0 Introduction

1.1 Overview of the Project

This project focuses on the development of a low-fidelity prototype for the SmartDesk Organizer & Productivity Assistant, an intelligent desk interface designed to help users manage productivity, organize for the user, and monitor basic wellness through clear visual feedback. The prototype demonstrates how a smart desk system can communicate with the system status, make reminders, have focus modes, and alerts using a consistent color-coded visual language.

Rather than implementing full hardware functionality, the prototype emphasizes Human-Computer Interaction (HCI) principles, particularly visibility of system status, intuitive interaction, and accessibility. By using familiar icons, colours, and simple explanations, the system helps users quickly understand what the desk is doing and what actions may be required. The design targets a wide range of users, including students, working professionals, and older adults, ensuring the interface is easy to learn and reduces cognitive load.

1.2 Objectives of the Prototype

The objectives of this prototype are as follows:

1. To demonstrate how a smart desk system can use visual cues and color-coded feedback to communicate system states such as focus, wellness, warnings, and critical alerts.
2. To evaluate the clarity and usability of interaction metaphors, including icons, colours, and short descriptions.
3. To support user understanding through a System Visual Guide, improving learnability and reducing confusion during first-time use.
4. To apply HCI principles such as visibility, feedback, consistency, and error prevention in interface design.
5. To ensure the interface is accessible and inclusive for users of different ages, abilities, and technical experience.

1.3 Summary of Prototype Features

The SmartDesk Organizer & Productivity Assistant prototype includes the following key features:

1. **System Visual Guide:** Introduces users to the colour language of the smart desk, helping them understand system behaviour at a glance.
2. **Interaction Cyan:** Represents active interaction states such as navigation, buttons, and scanning actions.
3. **Wellness Green:** Indicates health-related and safe states, such as medication reminders completed, items found, or stable system conditions.
4. **Warning Amber:** Alerts users to non-critical issues, including missing items, upcoming deadlines, or minor system warnings.
5. **Critical Red:** Signals that requiring immediate attention, such as critical alerts or system errors.
6. **Focus Purple:** Dedicated to deep work modes, scheduling, focus timers, and AI-generated productivity insights.
7. **Creative Emerald:** Supports creative tasks such as digital note-taking, handwriting, drawing, and idea organization.
8. **Consistent Interaction Metaphors:** Uses familiar icons and colours to reduce learning effort and improve user confidence.

2.0 Video Storyboarding

2.1 Link to Video Storyboarding

<https://youtu.be/f6MFU7HzL8?si=UaXn61r7m5MC1zDo>

2.2 Brief Description of the Storyboard Flow

The storyboard illustrates how the Smart Desk interface supports different user needs through adaptive design, clear visual cues, and intuitive task flows. The video follows three personas interacting with the Stage 2 prototype, demonstrating how the system enhances productivity, organization, and wellness.

Persona 1: Amina (Student – Easily Distracted, Needs Structure)

Amina uses the Smart Desk to stay focused during her study sessions.

- She begins at the Home Screen, where the dashboard clearly displays “Manage Tasks,” “Quick Notes,” and “Focus Mode.”
- She selects a task from the Productivity Board and activates Focus Mode.
- The interface shifts to a purple-themed countdown timer with notifications silenced.
- This helps her maintain concentration while the system tracks her progress.

The storyboard highlights how the Smart Desk reduces distractions and supports deep work for students who struggle with time management.

Persona 2: Mr. Tan (Elderly User – Needs Simplicity & Clarity)

Mr. Tan relies on the Smart Desk to manage his medication and monitor his health.

- He taps the “Health Assist” tile, which presents large text, simple icons, and color-coded reminders.
- The system shows his next medication time and displays vitals such as heart rate and blood pressure in Wellness Green.
- He reviews his health logs and confirms his medication with a single tap.

The storyboard demonstrates how the interface accommodates older adults through accessible design, minimal complexity, and supportive feedback.

Persona 3: Sarah (Busy Professional – Needs Efficiency & Speed)

Sarah uses the Smart Desk to locate her missing items before leaving for work.

- She opens “Find Lost Items” and views the Desk Inventory Map.
- A Warning Amber alert highlights her missing access card.
- She taps “Project Last Location,” and the desk surface illuminates the last scanned spot.
- She retrieves the item quickly and updates the status to “Found.”

The storyboard emphasizes how the Smart Desk saves time and reduces stress for fast-paced users who need reliable, instant feedback.

Unified Experience Across Personas

Although each persona has different needs, the Smart Desk maintains a consistent interaction model:

- **Color-coded feedback** (Cyan, Green, Amber, Red, Purple, Emerald)
- **Clear modular layout**
- **Simple navigation flow**
- **Adaptive task-specific screens**

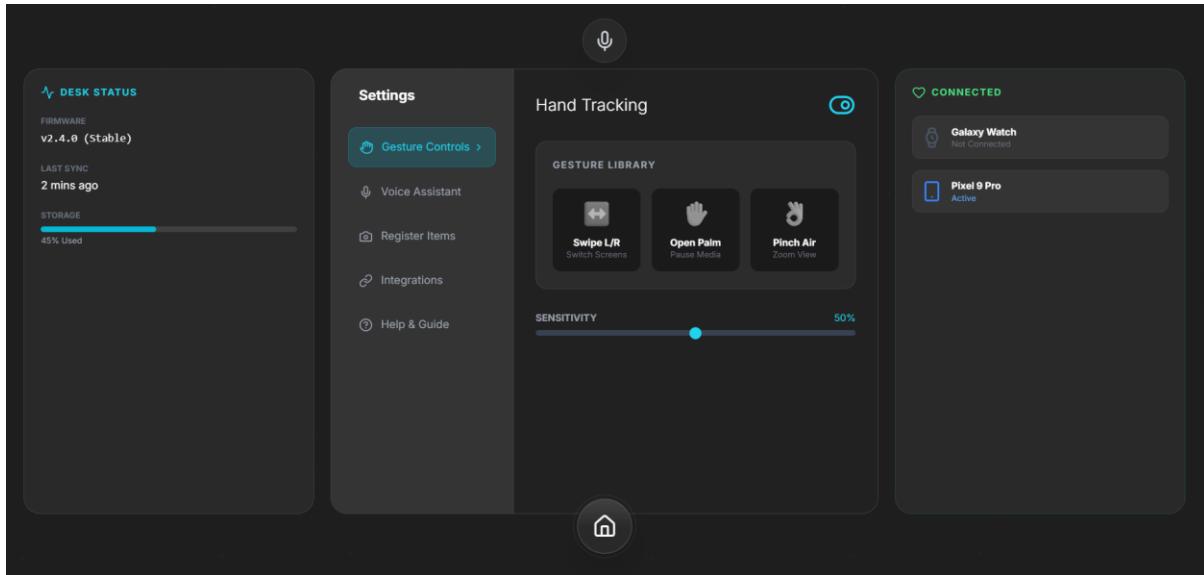
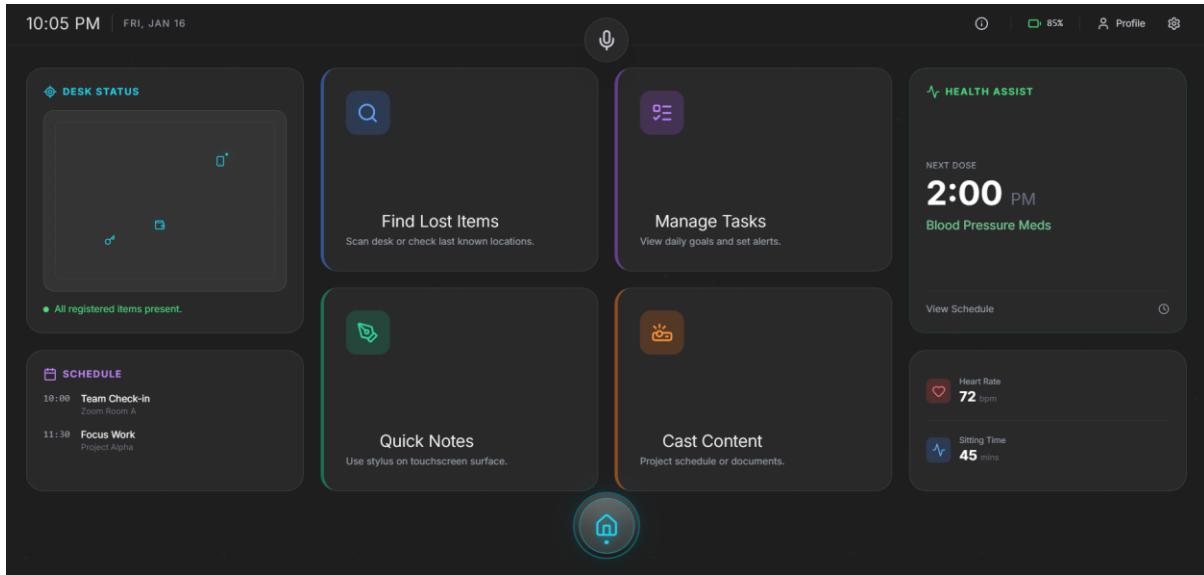
The storyboard showcases how the system remains inclusive, intuitive, and supportive across all user types, ensuring a seamless experience from productivity to wellness management.

3.0 Prototype

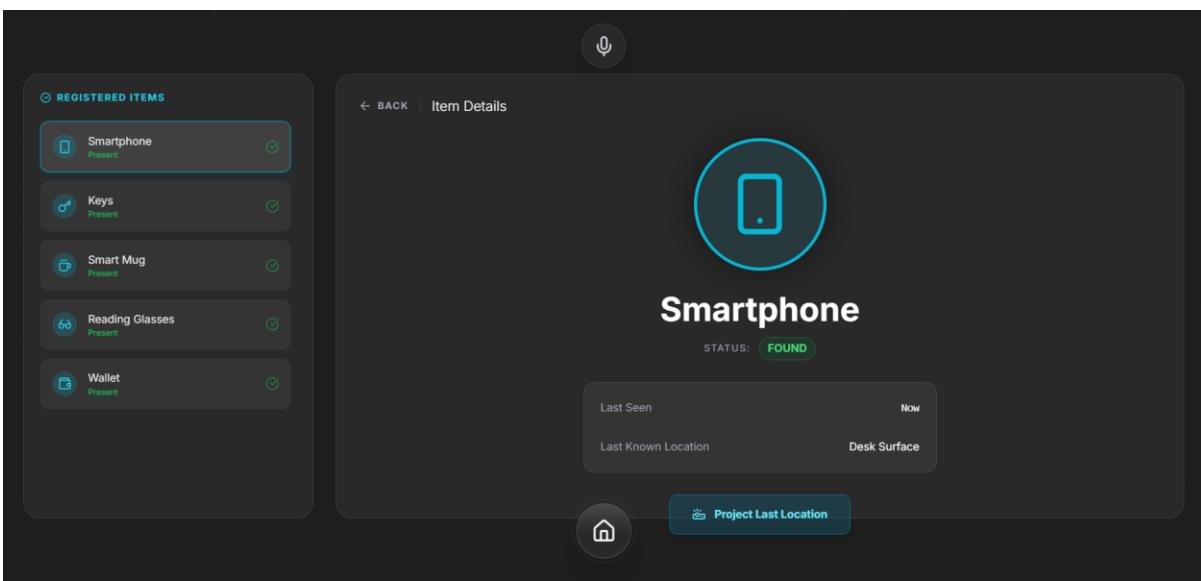
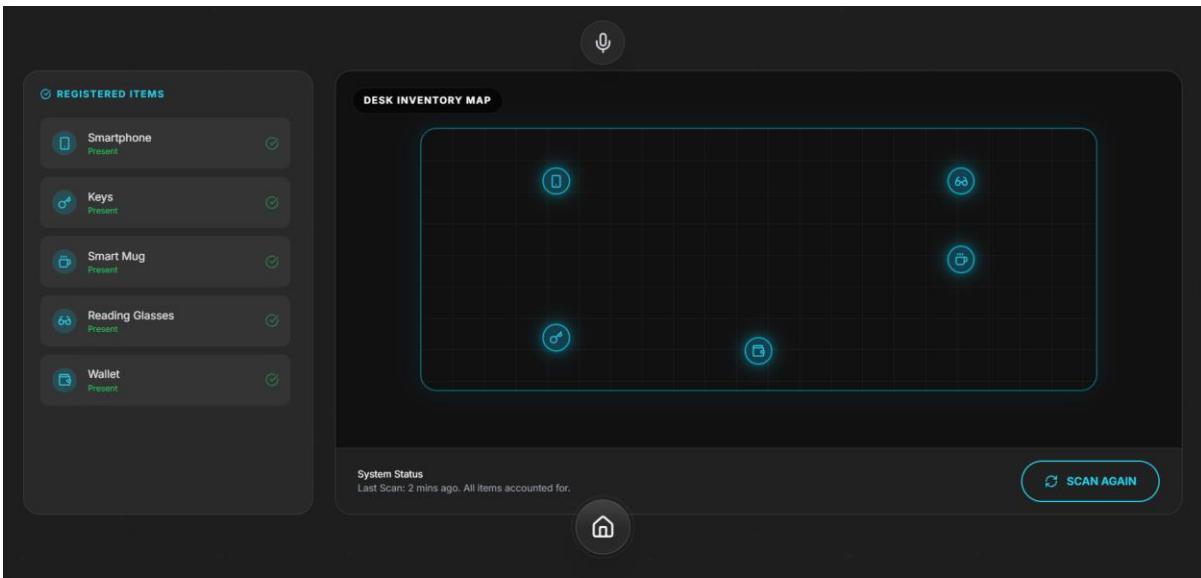
3.1 Home Screen

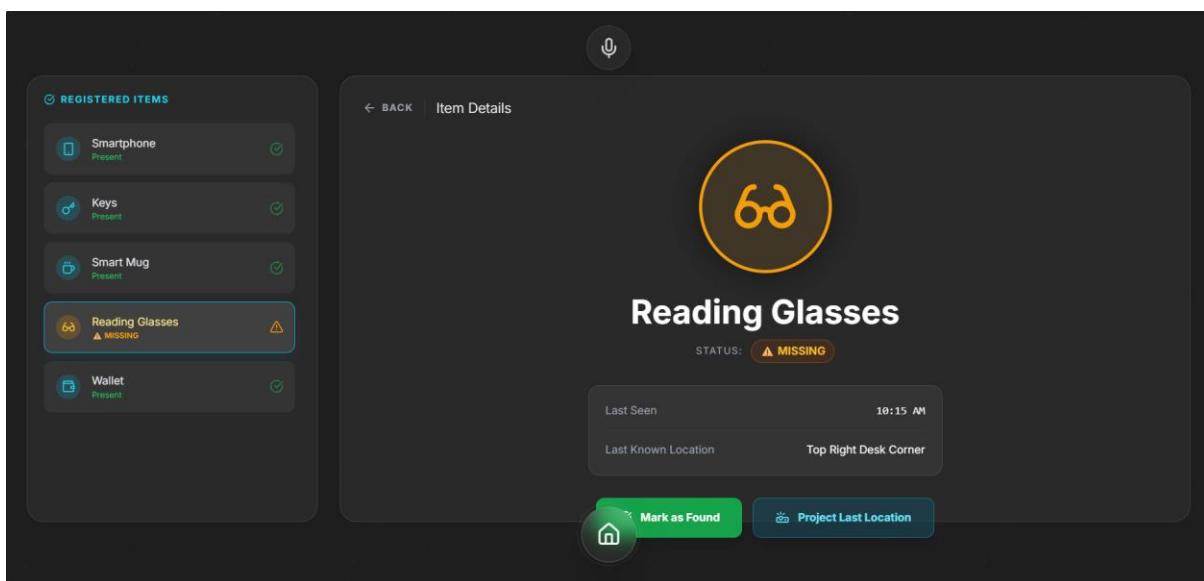
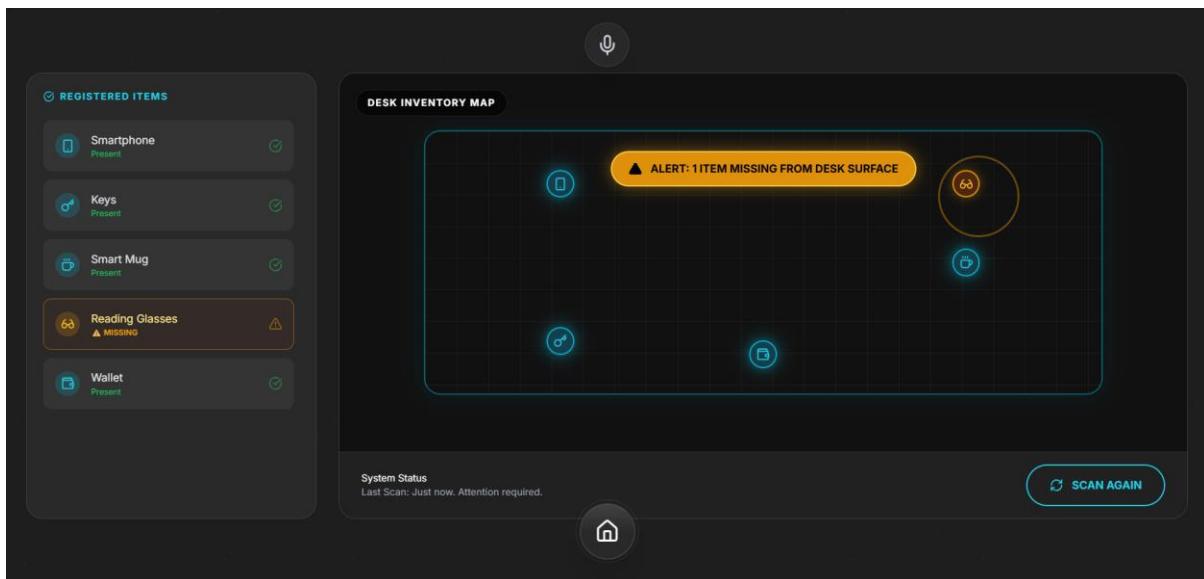
3.1.1 App



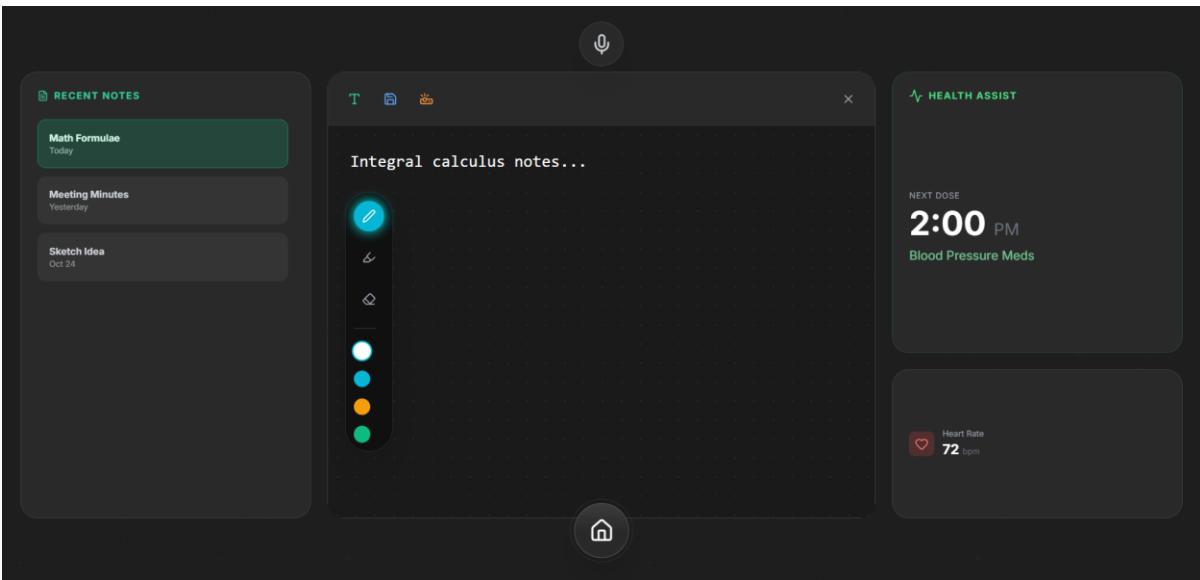
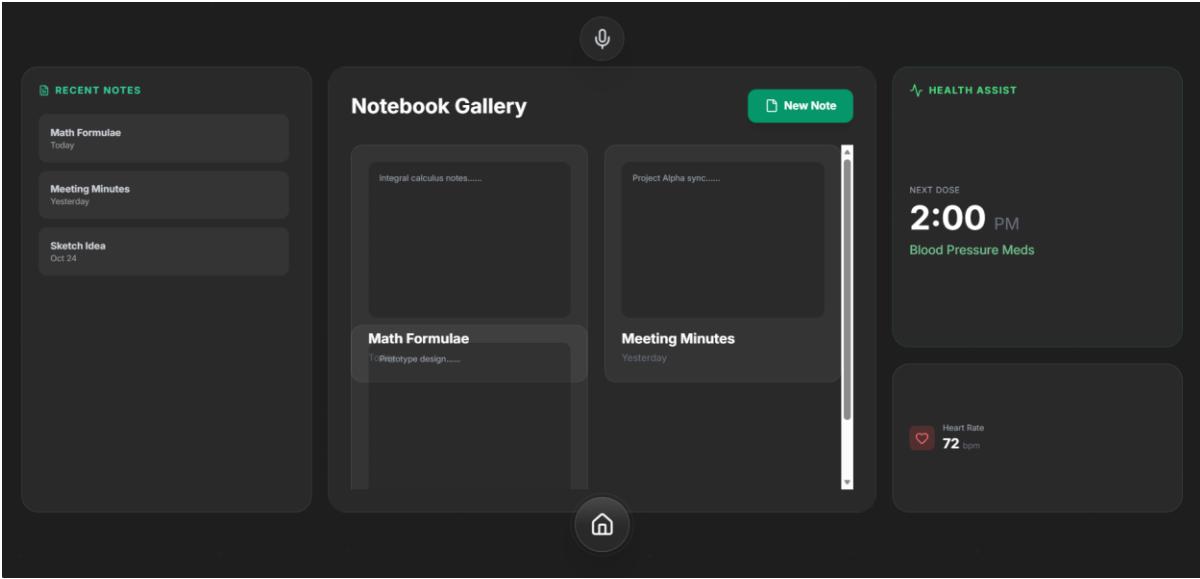


3.1.2 Find Lost Item





3.1.3 Quick Notes



3.1.4 Manage Task

Productivity Board
Manage your tasks and goals efficiently.

AI Insight
You usually study 'C++ Programming' at this time. Add to list? Dismiss Add

TODAY'S TIMELINE

- 12:00 • Lunch Break
- 01:00 Current Time
- 02:00 Free Slot
- 03:00 • Study Session

Submit Project Proposal
High Priority | Completed

Review Lecture Notes
Medium Priority | 2:00 PM

Buy Groceries
Low Priority | 5:30 PM

Call Clinic

+ Add Reminder ▶ Start Focus Mode

HEALTH ASSIST

NEXT DOSE
2:00 PM
Blood Pressure Meds

Heart Rate
72 bpm

TODAY'S TIMELINE

- 11:00 • Lunch Break
- 01:00 Current Time
- 02:00 Free Slot
- 03:00 • Study Session

CURRENT TASK
Review Lecture Notes

🔕 Notifications Silenced

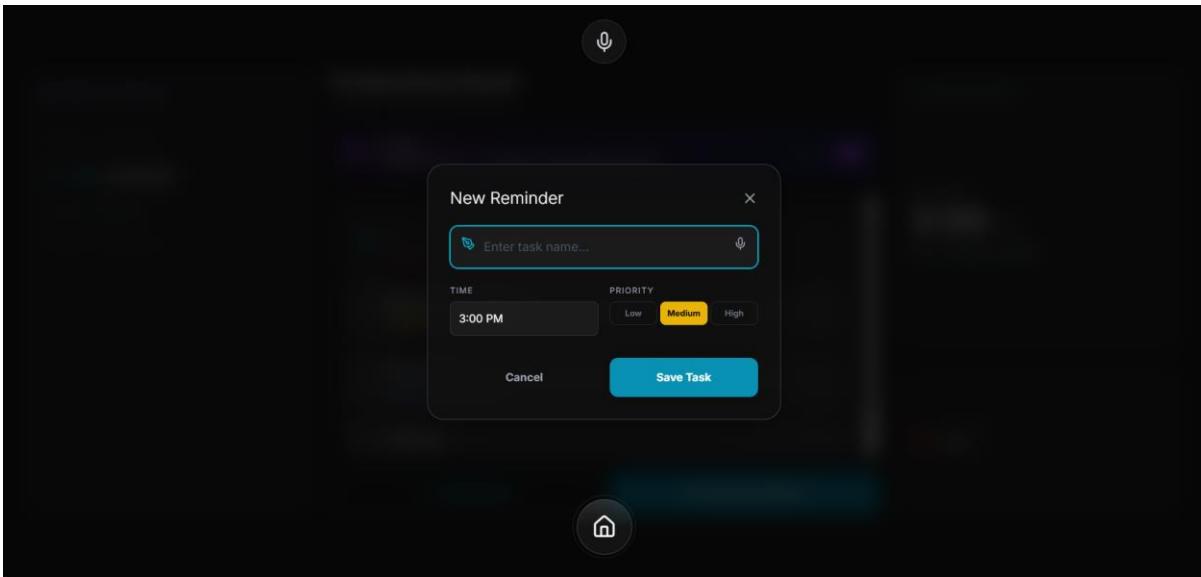
⌚ End Focus Mode

Long press to dismiss accidental exit

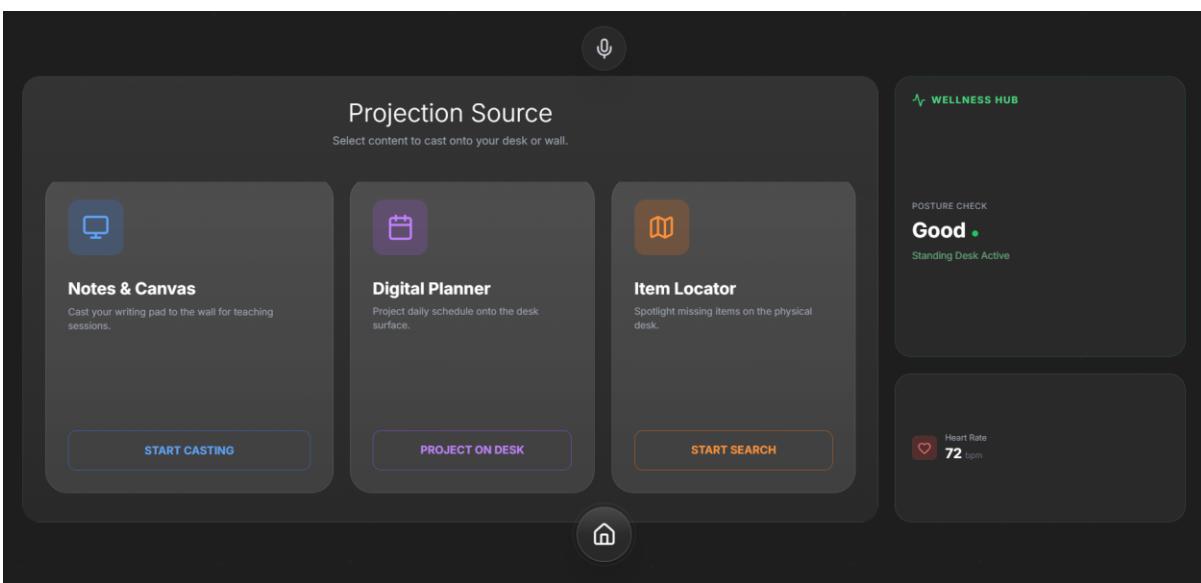
HEALTH ASSIST

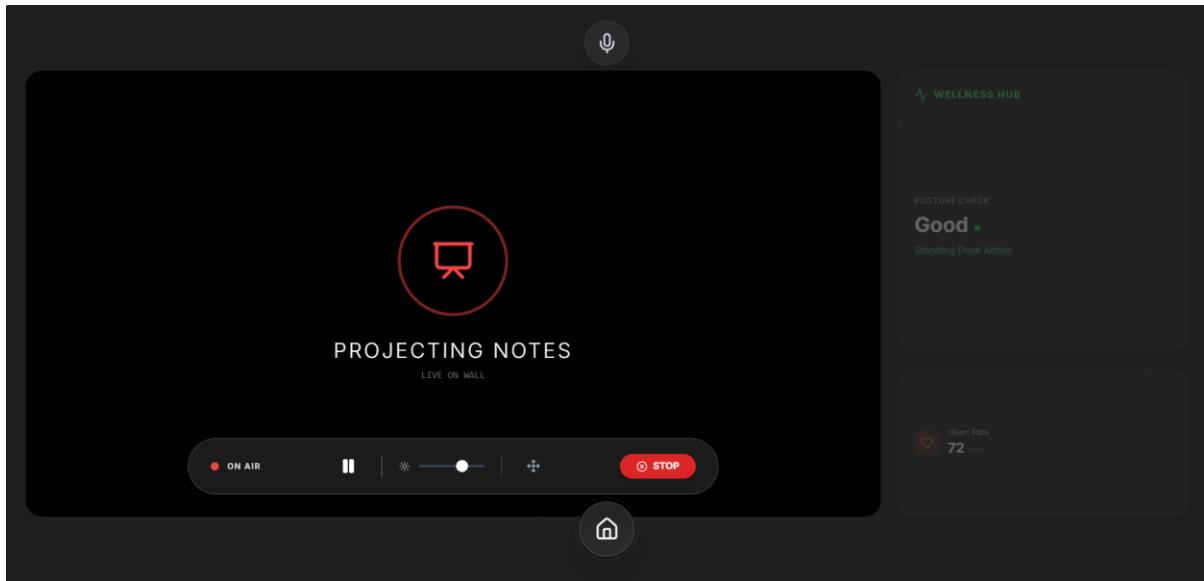
NEXT DOSE
2:00 PM
Blood Pressure Meds

Heart Rate
72 bpm

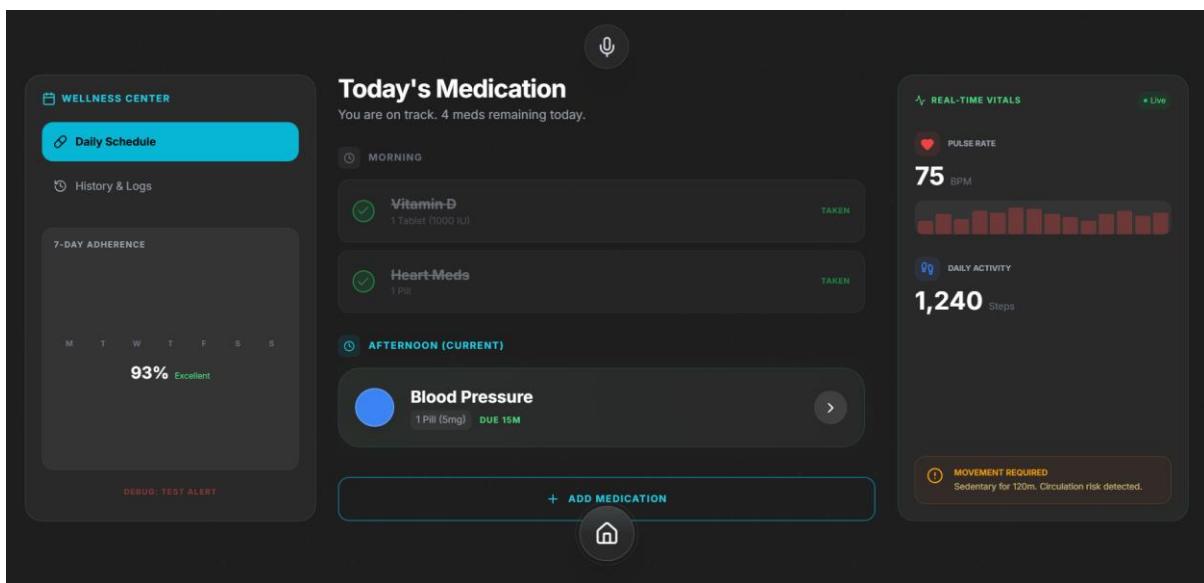


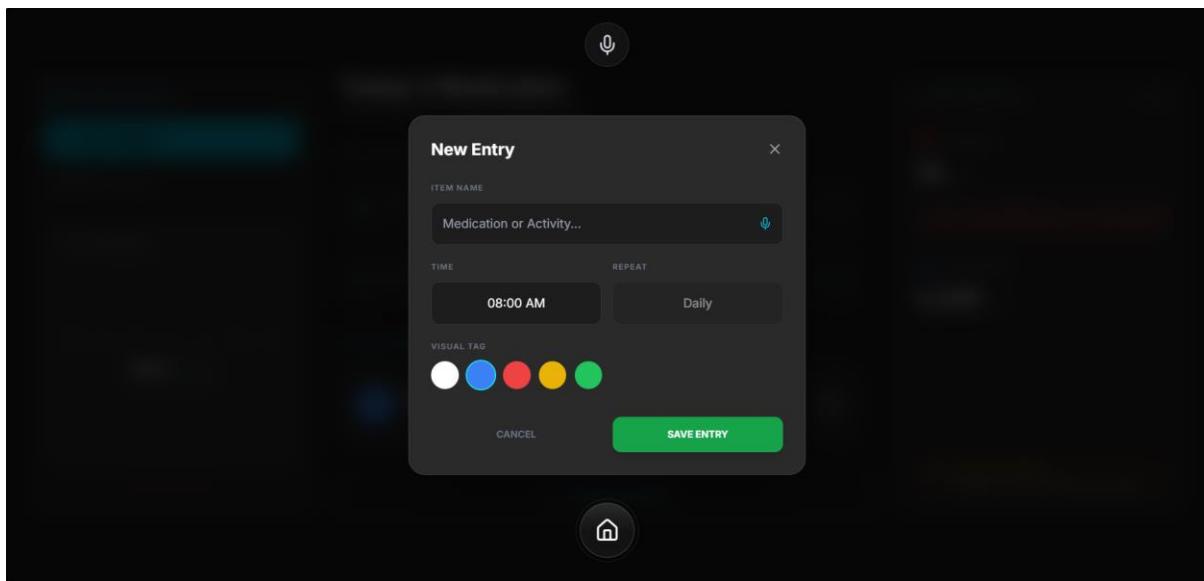
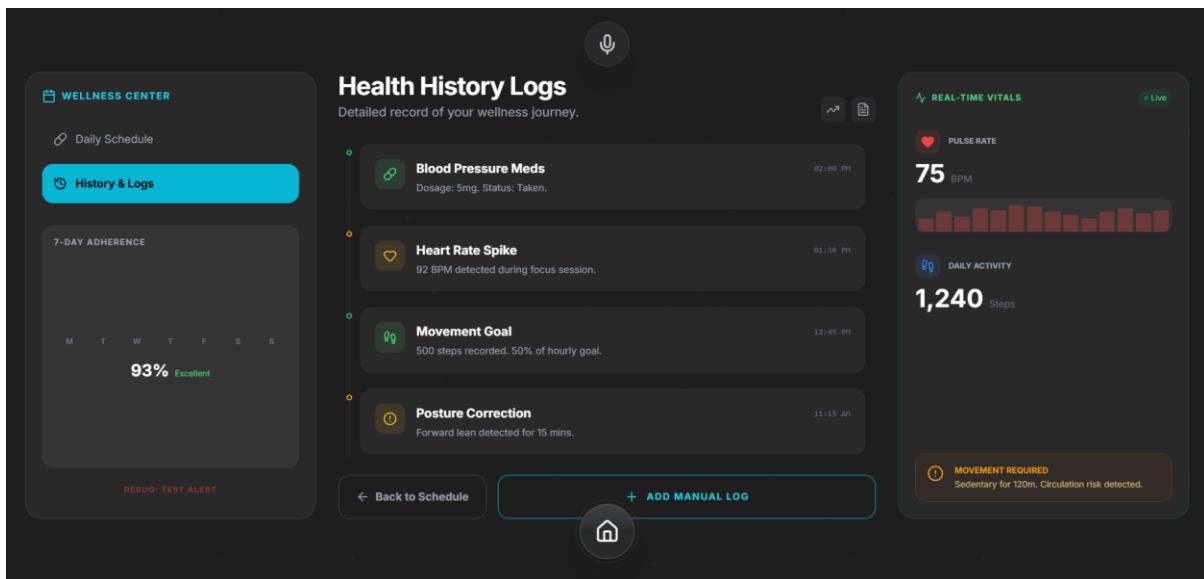
3.1.5 Cast Content





3.1.6 Health Assist





3.1 Key Interface Screens

The home screen of the **Smart Desk** prototype acts as a centralized dashboard, welcoming users to their productive workspace. It provides immediate access to essential tools and real-time environmental data. The interface is designed with a modular widget layout, utilizing clean spacing and intuitive icons to ensure a high level of usability.

The dashboard features clearly labelled navigation options such as:

- **Desk Status:** Provides real-time information on connected hardware and storage.
 - **Find Lost Items:** A dedicated tool for scanning and locating missing desk items.
 - **Manage Tasks:** A productivity hub for viewing daily goals and setting alerts.
 - **Quick Notes:** A digital notepad optimized for stylus use.
 - **Cast Content:** A management screen for projecting documents or schedules.
 - **Health Assist:** A centralized view for medication reminders and vital signs.
-

a. System Visual Guide

To improve readability and provide quick insights, the system employs a standardized colour language:

1. **Interaction Cyan:** Used for primary navigation, buttons, and active scanning states.
2. **Wellness Green:** Indicates health and safety, such as stable vital signs or medication adherence.
3. **Warning Amber:** Highlights missing items, upcoming deadlines, or minor health warnings.
4. **Critical Red:** Reserved for immediate focus, including critical heart alerts or system errors.
5. **Focus Purple:** Dedicated to deep work sessions, focus timers, and AI productivity insights.
6. **Creative Emerald:** Defines the "Idea Space" for notebooks and handwriting conversion.

b. Find Lost Item Interface

The system provides transparency and clarity regarding the user's belongings through two primary views:

1. **Desk Inventory Map:** Displays a grid-based visual representation of the desk surface, showing the exact location of registered items like smartphones, keys, and wallets.
2. **Item Details:** When an item is selected, the screen provides specific information, including its current status (e.g., "FOUND" or "MISSING"), last seen time, and the ability to "Project Last Location" directly onto the desk.

c. Health Assist & Wellness Hub

This interface transforms the desk into a health-conscious companion by organizing biometric and medical data:

1. **Medication Management:** Tracks daily schedules, showing which medications have been taken and providing countdowns for upcoming doses.
 2. **Real-Time Vitals:** Continuously monitors the user's pulse rate and daily activity (steps) to provide immediate health summaries.
 3. **Health History Logs:** Provides a chronological breakdown of wellness events, such as heart rate spikes or posture corrections, to help users track progress over time.
-

3.2 Task & Productivity Navigation

a. Manage Tasks & Focus Mode

To help users stay organized, the productivity interfaces include:

1. **Productivity Board:** Features an AI-powered "Insight" box that suggests tasks based on user habits.
2. **Focus Timer:** When a task is started, the system enters a dedicated mode with a large countdown timer and silenced notifications to promote deep work.
3. **Priority System:** Tasks are categorized by priority (High, Medium, Low) and displayed alongside a daily timeline for better time management.

b. Cast Content & Projection

Before initiating a presentation, the system allows users to select their **Projection Source**:

1. **Notes & Canvas:** For casting digital writing pad content to a wall for teaching or sharing.
2. **Digital Planner:** Projects the daily schedule directly onto the physical desk surface.
3. **Item Locator:** Uses the projector to spotlight the physical location of missing items on the desk.

4.0 Briefing Notes to Users

4.1 Summary of Verbal/Written Instructions

Hello! We are designing a new productivity and wellness system called the **Smart Desk**, which includes an interactive touchscreen surface, an integrated projection system, and AI-driven organizational tools. The Smart Desk helps users:

1. **Organize and Track Belongings:** Use the Desk Inventory Map and "Find Lost Items" feature to locate registered items like keys or phones.
2. **Monitor Health and Wellness:** Track vital signs (BPM), set medication reminders, and receive sedentary alerts through the Health Assist center.
3. **Enhance Productivity:** Manage daily schedules and utilize "Focus Mode" to eliminate distractions during deep work sessions.
4. **Digital Note-Taking:** Use the Quick Notes interface to capture digital handwriting and convert ideas into organized notebooks.
5. **Interactive Projection:** Cast schedules, documents, or item locations directly onto the desk surface or a nearby wall for better visibility.

Informed Consent We are conducting a usability study to test how well our prototype works and to gather ideas on how to improve it. You will interact with a prototype (mock-up version) of the Smart Desk interface.

Your participation is voluntary and anonymous. You can stop at any time. We will not collect personal details, and your feedback will only be used to improve the design.

This test simulates the real product experience. One of our team members will act as the "computer," responding to your clicks or taps on the interface. Please feel free to **speak out loud**—whether something is unclear, confusing, or even if something works really well, we want to hear it!

We hope to learn from your experience and make the Smart Desk better for real users like you.

Your first task is ready. Are you ready to begin? Let's go!

4.2 How the Briefing was Delivered

1. **Briefing Delivery:** The briefing was given verbally and supported with printed cue cards before each specific task.
2. **Environment:** Participants were guided one-on-one in a controlled, quiet setting to simulate a home office environment.
3. **Facilitation:** The facilitator acted as the interface, manually updating the screens or projections in response to the participants' inputs.

4. **Think-Aloud Protocol:** Users were specifically encouraged to “think aloud,” narrating their thought processes, expectations, and any frustrations throughout the test.
5. **Scenario Guidance:** Printed index cards containing specific scenarios (e.g., “Find your missing keys” or “Start a 25-minute focus session”) were handed to users one by one.

5.0 Index Cards (Scenario Tasks)

5.1 Task 1: [Locate a missing item using the Desk Inventory Map]

Instruction Card

1. From the **Home Screen**, observe the **Desk Status** widget to identify which item is missing.
2. Tap on the **Find Lost Items** tile to open the full **Desk Inventory Map**.

+1

3. Locate the item marked with a **Warning Amber** alert (e.g., Reading Glasses) in the sidebar.
4. Tap on the missing item to open **Item Details**, then select **Project Last Location** to have the desk physically highlight where the item was last scanned.
5. Once you have found the item, tap **Mark as Found** to update the system status.

5.2 Task 2: [Start a deep work session using Focus Mode]

Instruction Card

1. Navigate to the **Manage Tasks** section from the main dashboard.
 2. Review your **Productivity Board** and accept an **AI Insight** suggestion (e.g., “C++ Programming”) or tap **Add Reminder** to enter a new task.
 3. Select your current task from the list and tap the **Start Focus Mode** button.
 4. Verify that the **Focus Purple** interface has activated, displaying the countdown timer and the “Notifications Silenced” status.
 5. To end your session early, perform a **long-press** on the **End Focus Mode** button to prevent accidental exits.
-

5.3 Task 3: [Review health logs and manage daily medication]

Instruction Card

1. Tap on the **Health Assist** tile from the home screen.
 2. In the **Daily Schedule** view, locate your upcoming afternoon medication (e.g., Blood Pressure) and check the "Due" timer.
 3. Navigate to the **History & Logs** tab to review your **Wellness Journey**.
 4. Identify any recent alerts, such as a **Heart Rate Spike** or a **Posture Correction** warning.
 5. Tap **Add Manual Log** if you need to record a new health entry or activity not automatically tracked by the sensors.
-

5.4 Task 4: [Configure hand tracking and gesture sensitivity]

Instruction Card

1. Access the **Settings** menu by tapping the gear icon in the top right corner of the dashboard.
2. Select **Gesture Controls** from the sidebar to open the **Hand Tracking** interface.
3. Review the **Gesture Library** to familiarize yourself with the **Swipe L/R**, **Open Palm**, and **Pinch Air** commands.
4. Adjust the **Sensitivity** slider to **50%** to ensure the sensors accurately capture your movements.
5. Ensure the toggle for **Hand Tracking** is switched to "On" before returning to the Home Screen.

6.0 Users' Demographics

6.1 Gender, Age, Occupation

The Smart Desk prototype was tested by a group of young adults aged between **20 to 26 years old**, representing users who actively balance academic, professional, and personal responsibilities. These participants reflect the target audience for a productivity-focused smart workspace system:

1. **Daniel – Male, 22 years old, university student**
2. **Farah – Female, 21 years old, part-time tutor and final-year student**
3. **Haziq – Male, 25 years old, junior IT support technician**

This demographic was selected because they frequently multitask, manage tight schedules, and rely heavily on digital tools to stay organized — making them ideal evaluators for the Smart Desk interface.

6.2 Technology Usage Background

All participants are active users of digital devices, including laptops, smartphones, and productivity apps. They regularly interact with technology for studying, work, communication, and personal organization:

1. **Daniel** frequently uses apps like Google Calendar, Notion, and Trello to manage assignments and deadlines.
2. **Farah** relies on digital note-taking tools such as GoodNotes and Microsoft OneNote for tutoring preparation and class revision.
3. **Haziq** uses system monitoring tools, cloud storage platforms, and device-syncing apps as part of his daily IT workflow.

Overall, all participants are comfortable navigating modern interfaces and can quickly adapt to new systems, making them suitable testers for a smart desk environment.

6.3 Prior Experience with Similar Systems

None of the participants had previously used a **smart desk interface** or an **interactive workspace system**, but all had relevant experience with:

- Productivity apps (Notion, Google Tasks, Microsoft To Do)
- Digital planners and scheduling tools
- Device-syncing ecosystems (Windows, Android, iOS)
- Health and wellness apps (Samsung Health, Apple Health, Mi Fit)
- Basic smart home devices (Bluetooth trackers, smart lamps, voice assistants)

Their familiarity with digital ecosystems and productivity tools made them ideal testers for a system designed to enhance organization, focus, and wellness through an integrated smart desk interface.

7.0 Task-Based Usability Testing

7.1 User 1

The user is welcomed to the SmartDesk testing area and briefed on the purpose of the session. He is informed that the session involves completing three tasks using the SmartDesk interface and companion application.

Task 1: Locate and track items using SmartDesk

The user places tagged items on the desk and removes one item. The system correctly detects the missing item and updates the status in real time on the companion app. The user completes the task without assistance and states that the feature is useful for preventing misplaced items.

Task 2: Control desk functions using gesture and voice commands

The user successfully starts a focus timer using hand gestures and checks his schedule using a voice command. He reports that both interaction methods feel responsive and intuitive.

Task 3: Create a personalized work session

The user uses the stylus to write notes and activates the projection feature to display his schedule. He also reviews the AI-generated daily plan. He finds the integration smooth and believes the system would improve productivity. No major issues are reported.

7.2 User 2

The user is welcomed and briefed on the testing procedure. This user has limited prior experience with smart devices.

Task 1: Locate and track items using SmartDesk

The user initially forgets to tag one item, causing confusion when the system does not display it. After guidance, he completes the task successfully. He suggests clearer instructions or onboarding for item tagging.

Task 2: Control desk functions using gestures and voice commands

The user struggles slightly with gesture recognition and needs to repeat the hand movement. However, voice commands are completed successfully. He mentions that gesture sensitivity could be improved.

Task 3: Create a personalized work session

The user uses the stylus but reports a short learning curve when writing for the first time. He appreciates the AI-generated plan but requests simpler customization options.

7.3 User 3

The user is welcomed and informed that the session focuses on accessibility and everyday use.

Task 1: Locate and track items using SmartDesk

The user successfully places and removes items, and the system correctly sends a missing-item notification. He states that this feature would be especially helpful for daily routines.

Task 2: Control desk functions using gestures and voice commands

The user prefers voice commands over gestures due to limited hand mobility. He completes all voice-based interactions smoothly and comments that the system is accessible and inclusive.

Task 3: Create a personalized work session

The user chooses not to use the stylus and instead reviews projected reminders and notifications. He finds the projection feature helpful for visibility but suggests larger text options.

7.4 Observations

Task 1: Locate and Track Items Using SmartDesk

• User 1

1. User 1 understood the task and its objective clearly.
2. Placed tagged items on the SmartDesk surface without assistance.
3. Removed one item from the desk as instructed.
4. Observed the real-time update on the companion app.
5. Correctly identified the missing item.
6. Received a reminder notification from the system.
7. Completed the task smoothly and confidently.

• User 2

1. User 2 understood the task but appeared slightly unsure at the beginning.
2. Placed items on the desk but forgot to tag one item.
3. Did not initially see the item displayed in the app.
4. Required brief guidance to tag the item correctly.
5. After tagging, the system updated the item status successfully.
6. Expressed relief after seeing the correct item list.
7. Completed the task with minor hesitation.

• User 3

1. User 3 understood the task immediately.
2. Placed and removed items correctly on the desk surface.
3. Noticed the system response quickly.

4. Received a missing-item notification without delay.
5. Confirmed the item status through the companion app.
6. Commented that the feature would be useful for daily routines.
7. Completed the task confidently and without confusion.

Task 2: Control Desk Functions Using Gesture and Voice Commands

• User 1

1. User 1 understood the task instructions clearly.
2. Performed the hand gesture to start a focus timer.
3. The system recognized the gesture on the first attempt.
4. Used a voice command to check the schedule.
5. The system responded accurately.
6. User 1 reported that both interaction methods felt natural.
7. Completed the task efficiently.

• User 2

1. User 2 understood the task but hesitated before using gestures.
2. Performed the hand gesture but the system did not recognize it initially.
3. Repeated the gesture with better alignment.
4. Successfully started the timer on the second attempt.
5. Used voice command successfully on the first attempt.
6. Mentioned that voice control was easier than gestures.
7. Completed the task with slight difficulty.

• User 3

1. User 3 understood the task and chose to use voice commands only.
2. Issued a voice command to start the focus timer.
3. The system responded immediately.
4. Asked the system to read the schedule aloud.
5. Voice output was clear and easy to understand.
6. Commented that voice control was very helpful for accessibility.
7. Completed the task confidently.

Task 3: Create a Personalized Work Session

- **User 1**

1. User 1 understood the task and its purpose.
2. Used the stylus to write short notes on the desk screen.
3. Activated the projection feature to display the schedule.
4. Reviewed the AI-generated daily plan.
5. Confirmed the setup through the companion app.
6. Expressed satisfaction with the overall workflow.
7. Completed the task without difficulty.

- **User 2**

1. User 2 understood the task but needed time to explore the interface.
2. Attempted to use the stylus and required brief adjustment.
3. Successfully wrote notes after practice.
4. Viewed the projected reminders on the desk surface.
5. Found the AI-generated plan helpful but slightly complex.
6. Suggested simpler customization options.
7. Completed the task with minor hesitation.

- **User 3**

1. User 3 understood the task clearly.
2. Chose not to use the stylus and relied on projection features.
3. Viewed reminders and notifications clearly on the desk surface.
4. Reviewed the personalized plan using the companion app.
5. Appreciated the visibility and clarity of the interface.
6. Suggested larger text options for better readability.
7. Completed the task comfortably and confidently.

7.4 Observations

Task 1: Locate and Track Items Using SmartDesk

- **User 1**

1. User 1 understood the task and its objective clearly.
2. Placed tagged items on the SmartDesk surface without assistance.
3. Removed one item from the desk as instructed.
4. Observed the real-time update on the companion app.
5. Correctly identified the missing item.
6. Received a reminder notification from the system.
7. Completed the task smoothly and confidently.

- **User 2**

1. User 2 understood the task but appeared slightly unsure at the beginning.
2. Placed items on the desk but forgot to tag one item.
3. Did not initially see the item displayed in the app.
4. Required brief guidance to tag the item correctly.
5. After tagging, the system updated the item status successfully.
6. Expressed relief after seeing the correct item list.
7. Completed the task with minor hesitation.

- **User 3**

1. User 3 understood the task immediately.
 2. Placed and removed items correctly on the desk surface.
 3. Noticed the system response quickly.
 4. Received a missing-item notification without delay.
 5. Confirmed the item status through the companion app.
 6. Commented that the feature would be useful for daily routines.
 7. Completed the task confidently and without confusion.
-

Task 2: Control Desk Functions Using Gesture and Voice Commands

- **User 1**

1. User 1 understood the task instructions clearly.
2. Performed the hand gesture to start a focus timer.
3. The system recognized the gesture on the first attempt.
4. Used a voice command to check the schedule.
5. The system responded accurately.
6. User 1 reported that both interaction methods felt natural.
7. Completed the task efficiently.

- **User 2**

1. User 2 understood the task but hesitated before using gestures.
2. Performed the hand gesture but the system did not recognize it initially.
3. Repeated the gesture with better alignment.
4. Successfully started the timer on the second attempt.
5. Used voice command successfully on the first attempt.
6. Mentioned that voice control was easier than gestures.
7. Completed the task with slight difficulty.

- **User 3**

1. User 3 understood the task and chose to use voice commands only.
2. Issued a voice command to start the focus timer.
3. The system responded immediately.
4. Asked the system to read the schedule aloud.
5. Voice output was clear and easy to understand.
6. Commented that voice control was very helpful for accessibility.
7. Completed the task confidently.

Task 3: Create a Personalized Work Session

- **User 1**

1. User 1 understood the task and its purpose.

2. Used the stylus to write short notes on the desk screen.
3. Activated the projection feature to display the schedule.
4. Reviewed the AI-generated daily plan.
5. Confirmed the setup through the companion app.
6. Expressed satisfaction with the overall workflow.
7. Completed the task without difficulty.

- **User 2**

1. User 2 understood the task but needed time to explore the interface.
2. Attempted to use the stylus and required brief adjustment.
3. Successfully wrote notes after practice.
4. Viewed the projected reminders on the desk surface.
5. Found the AI-generated plan helpful but slightly complex.
6. Suggested simpler customization options.
7. Completed the task with minor hesitation.

- **User 3**

1. User 3 understood the task clearly.
2. Chose not to use the stylus and relied on projection features.
3. Viewed reminders and notifications clearly on the desk surface.
4. Reviewed the personalized plan using the companion app.
5. Appreciated the visibility and clarity of the interface.
6. Suggested larger text options for better readability.
7. Completed the task comfortably and confidently.

7.5 Results

Task 1: Locate and Track Items Using SmartDesk

What was easy?

- **User 1:** – Easily understood how to place and remove tagged items
- **User 2:** – The item list in the companion app was clear once tagging was completed
- **User 3:** – Notifications clearly indicated when an item was missing

What was difficult?

- **User 1:** – None mentioned
- **User 2:** – Initially forgot to tag an item, causing confusion
- **User 3:** – None mentioned

What would you suggest to improve the interaction flow?

- **User 1:** – Add visual indicators on the desk to show item detection
- **User 2:** – Provide clearer onboarding instructions for item tagging
- **User 3:** – Add audio feedback when items are removed

Would you use/not use the system in real life? Please give a brief reason.

- **User 1:** – Yes. Helps prevent losing important items
- **User 2:** – Yes. Useful once the setup is clearly explained
- **User 3:** – Yes. Convenient for daily routines

Task 2: Control Desk Functions Using Gesture and Voice Commands

What was easy?

- **User 1:** – Gesture and voice controls were responsive
- **User 2:** – Voice commands were easy to use
- **User 3:** – Voice interaction felt natural and accessible

What was difficult?

- **User 1:** – None mentioned
- **User 2:** – Gesture recognition was inconsistent
- **User 3:** – None mentioned

What would you suggest to improve the interaction flow?

- **User 1:** – Add gesture tutorials on first use
- **User 2:** – Improve gesture sensitivity and feedback
- **User 3:** – Allow customization of voice command phrases

Would you use/not use the system in real life? Please give a brief reason.

- **User 1:** – Yes. Hands-free control is very convenient
- **User 2:** – Yes. Voice commands reduce effort
- **User 3:** – Yes. Supports accessibility needs

Task 3: Create a Personalized Work Session

What was easy?

- **User 1:** – Writing notes with the stylus felt natural
- **User 2:** – Viewing projected schedules was clear
- **User 3:** – Reviewing personalized plans through the app was simple

What was difficult?

- **User 1:** – None mentioned
- **User 2:** – Needed time to get used to the stylus
- **User 3:** – None mentioned

What would you suggest to improve the interaction flow?

- **User 1:** – Add more stylus tools and options
- **User 2:** – Simplify the customization of plans
- **User 3:** – Increase text size and contrast options

Would you use/not use the system in real life? Please give a brief reason.

- **User 1:** – Yes. Combines productivity and creativity
- **User 2:** – Yes. Helpful after some practice
- **User 3:** – Yes. Easy to follow and visually clear

8.0 FINDINGS

8.1 Identified Usability Problems

User 1

After running all three tasks with User 1, several usability issues were identified:

1. Task 1 – Locate and Track Items:

The user completed the task smoothly; however, the system relied mainly on app notifications to indicate item detection. The lack of a clear on-desk visual or audio confirmation may cause uncertainty for users who do not frequently check the companion app. Adding immediate feedback on the desk surface could improve user confidence.

2. Task 2 – Gesture and Voice Controls:

Although the user successfully used both gesture and voice commands, the system did not provide sufficient guidance on available gestures. First-time users may be unaware of supported hand movements. A brief gesture tutorial or visual cue would improve learnability.

3. Task 3 – Create a Personalized Work Session:

The user found the personalized plan useful but felt that the customization options were limited. The system did not clearly explain how AI recommendations were generated, which may reduce user trust. Providing a short explanation or editable suggestions could enhance transparency.

User 2

After completing all three tasks, the following usability problems were observed for User 2:

1. Task 1 – Locate and Track Items:

The user experienced confusion when an item was not displayed due to missing tags. The system did not clearly inform the user that tagging was required before tracking. This lack of onboarding guidance may frustrate first-time users.

2. Task 2 – Gesture and Voice Controls:

Gesture recognition was inconsistent for this user, requiring multiple attempts. The system did not provide feedback indicating incorrect gesture positioning. This could lead to repeated errors and reduced efficiency.

3. Task 3 – Create a Personalized Work Session:

The user needed time to adapt to the stylus interface. The absence of a short stylus usage guide or practice mode increased the learning curve for new users.

User 3

Based on the tasks performed by User 3, the following usability issues were identified:

1. Task 1 – Locate and Track Items:

While the task was completed successfully, the system relied heavily on visual notifications. Users with visual limitations may benefit from stronger audio feedback or vibration alerts through the companion app.

2. Task 2 – Gesture and Voice Controls:

The user preferred voice commands due to limited hand mobility. However, the system did not offer an option to disable gesture prompts, which could create unnecessary visual clutter. Allowing users to customize interaction modes would improve accessibility.

3. Task 3 – Create a Personalized Work Session:

The projected interface text appeared small for prolonged viewing. The lack of adjustable text size or contrast options may reduce comfort for users with visual strain.

8.2 User Feedback Summary

The usability testing session involving three participants provided valuable insights into the functionality, usability, and overall user experience of the SmartDesk system. All participants were able to complete the three core tasks—item tracking, gesture and voice control, and personalized work session setup—without critical system failures. However, users also shared constructive feedback highlighting areas for improvement. The summary of feedback is presented below.

Positive Feedback

All users reported that the SmartDesk interface and companion application were generally intuitive after a short familiarization period. Participants appreciated the item tracking feature, noting that real-time notifications helped prevent misplaced objects. Gesture and voice controls were viewed positively, particularly voice commands, which users found convenient for hands-free interaction.

The stylus support and projection features were well received, especially by users who frequently take notes or manage schedules. Participants also found the AI-generated personalized plans helpful in structuring their daily tasks and improving productivity. Overall, users felt that SmartDesk successfully integrates productivity, wellness, and convenience into a single system.

Areas of Concern

Some users experienced confusion during the initial setup process, particularly regarding item tagging and gesture usage. The lack of a guided onboarding process led to minor hesitation for

first-time users. Gesture recognition was inconsistent for one participant, requiring repeated attempts.

In addition, several users expressed a desire for clearer system feedback, such as visual or audio confirmations when actions were completed successfully. Accessibility-related concerns were also raised, including small text size in projected displays and limited customization of interaction modes. These issues occasionally affected efficiency and user confidence.

8.3 Proposed Improvements & Design Iteration Suggestions

Based on user feedback and direct observation during usability testing, several design improvements are recommended for future iterations of the SmartDesk prototype. These suggestions aim to enhance usability, accessibility, and overall user satisfaction.

Interface and Interaction Design

It is recommended to implement clear visual and auditory feedback, such as confirmation animations or sounds, when key actions are completed (e.g., item detection, timer activation, or plan confirmation). A guided onboarding tutorial should be introduced for first-time users, explaining essential features such as item tagging, gesture usage, and voice commands. Contextual help icons or tooltips could further assist users in understanding system functions.

Gesture, Voice, and Accessibility Enhancements

Improving gesture recognition sensitivity and providing real-time feedback for incorrect gestures would reduce user frustration. Users should be allowed to customize interaction methods, such as enabling voice-only control or disabling gestures if preferred. Additionally, adjustable text size, contrast options, and audio feedback should be included to improve accessibility for users with visual or mobility limitations.

Productivity and User Experience Improvements

The AI-based personalized planning feature could be enhanced by allowing users to edit or fine-tune recommendations, increasing transparency and trust. Motivational reminders and productivity prompts may be integrated to encourage consistent usage. A Focus Mode feature is also suggested, allowing users to temporarily silence notifications during work sessions while providing a summary afterward.

These proposed improvements directly address the usability issues identified during testing and support the continued refinement of SmartDesk into a more user-centered, accessible, and effective smart productivity solution.

9.0 Appendices

