TEAM ROLES AND BREAKDOWN

SOPHIA : Database Hardware Backend

IKER : Hardware Backend Database

FAVOUR :UI/UX Design Frontend Testing

IKRAM : Frontend Hardware Github

**IDEA BREAKDOWN (15 september )**

**The Idea:**

A smart medication reminder system combining a wearable device with an app to help users stay on track with their medication schedules.

**Smart Medication Reminder System** Target Users: Elderly, visually impaired, or people with memory challenges • motion sensor, buzzer, LED, light sensor • Large buttons, audio cues, feedback • Helps anyone manage medication schedules

USER INTERFACE AND TESTING : (18 – 24 SEPTEMBER )

<https://www.figma.com/design/KdbZUIp1p2ycNemRNkvxU7/Pill-Pal?node-id=0-1&t=DmFpZZKHQK7Lr31J-1>

**USER**

* **Workaholics:** People who are constantly on the go with demanding schedules that have to take time-sensitive medications (like ADHD stimulants). If their dose is missed they may suffer the consequence of symptom breakthrough or sleep issues. PillPal will help them pack their medication on the go or remind them to prevent missed doses.
* **Contraceptive Users:** People who take oral contraceptives that require a consistent daily timing within a 3 hour window(Planned Parenthood, n.d.) to maintain that is it effective. Missing birth control pills leads to hormone level drops, reducing effectiveness and increasing pregnancy risk, along with side effects like breakthrough bleeding or nausea (K Health, 2022).
* **Athletes/Gym-goers:** People who workout regularly/professional athletes take daily performance supplements (pre-workout, protein). These are timed around their workout for better results. Taking supplements too early can cause the effects wear off and too late have no benefit during workout.

**Demographic / Character**

* Aged 17-66, but age inclusive
* Active lifestyle, busy schedules, values independence in managing their own help
* Owns smartphone, technical skills are basic to moderate comfort with digital platforms
* Struggle with routine, just need medication backup

**Motivations**

* Stay ahead of medication schedules without stress and anxiety
* Prevent relapse of symptoms
* Manage their own health, not wanting to rely on others - independence
* Take medication privately without attracting attention

SYSTEM

1. **Concept Model**

The PillPal system is an IoT-based smart pillbox and mobile companion application designed to help users manage their medication schedules efficiently. The portable pillbox device (about the size of an AirPods case) provides reminders through vibration, LED light, and buzzer alerts, while the app sends notifications, records medication history, and allows easy schedule management.

The system aims to support users who need consistent medication adherence by combining physical and digital reminders. It can be paired to the app via Bluetooth and carried anywhere, offering accessibility, reliability, and convenience.

1. **Description**

* When the system is powered on, the pillbox connects to the user’s smartphone application via Bluetooth. The app displays a simple interface where users can sign in, create an account, and manage their medication schedules.
* Users can add new medications by entering the name, dosage times, and repetition frequency (daily, weekly, or custom). Each medication can be assigned to one of six compartment slots in the pillbox. Once saved, the schedule is transferred to the pillbox, which vibrates, beeps, and lights up at the set times to remind the user.
* The app also sends push notifications before each dose and logs whether the user took, snoozed, or missed the medication. If the phone is unavailable, the pillbox continues to alert the user independently.
* Users can view their medication history, check streaks for consistency, and clear or review past logs. The settings section allows customization of notification preferences such as sound, vibration, LED light, reminder timing, and accessibility options like a dyslexia-friendly font.
* The hardware uses a Raspberry Pi Zero connected to a PiSugar 2 battery for portability and power management. The system includes vibration motors, LED indicators, and a buzzer, all protected and managed through basic electronic components such as transistors, resistors, diodes, and capacitors on a perfboard.
* Each user action is confirmed by either the app or the device (for example, when saving a medication or acknowledging a reminder), ensuring consistent feedback and reliability in use.

1. **System Design**

The PillPal system integrates both hardware and software components to deliver medication reminders and tracking through synchronized alerts and notifications.

The hardware design is based on a Raspberry Pi Zero microcontroller powered by a PiSugar 2 battery (1200 mAh). The circuit includes:

* Coin vibration motor (3–5 V) for tactile alerts
* 5 V buzzer for audio reminders
* 3 mm LED indicator for visual feedback and battery status
* NPN 2N2222 transistors for controlling the motor and buzzer
* 1N4148 diodes for protection
* Resistors (1 kΩ, 220–330 Ω) and capacitors (100 µF, 100 nF) for stable current flow
* The electronic components are soldered on a perfboard and insulated using 3M/VHB tape and hot glue for portability and safety. The pillbox can attach to straps or keychains for convenient carrying.
* The software design includes the PillPal mobile app and the embedded system software.
* The embedded software runs on the Raspberry Pi Zero, storing medication schedules locally and controlling hardware components for alerts.
* The mobile app allows the user to create and edit schedules, set reminder times, view history, and customize notification preferences.
* Bluetooth communication connects the app and pillbox, allowing data synchronization and real-time updates.

When an alert is triggered, the Pi Zero activates the vibration motor, buzzer, and LED to notify the user. At the same time, the mobile app sends a push notification, allowing the user to confirm, snooze, or mark the medication as taken. The app then logs the response and updates the streak history.

This structure ensures that reminders are reliable even when the phone is disconnected, while synchronization restores missed logs once reconnected.

HARDWARE LIST :



SECURITY PLAN

How the hardware will be powered and connected to the internet

Power: PiSugar 1200 mAh boosts the Raspberry Pi Zero, charges the battery over USB-C and exposes battery telemetry (voltage/percentage). The Pi reads that battery status via the PiSugar daemon/CLI.

Sensors: A vibration motor and a buzzer are each driven from 5v rails through 2N2222 NPN transistors, with 1 kΩ base resistors, 1N4148 diodes and a 100 µF bulk capacitor across 5v GND near the motor (to damp inrush). Status LED is current-limited by 220–330 Ω resistor.

Network: The Pi connects to the internet using Wi-Fi\* (client mode) to the user’s phone hotspot (WPA2). No Bluetooth is required for data—Wi-Fi handles everything.

(If there’s no internet, the device works offline and syncs later.)

DATA STORAGE

What data the device will gather

From the Pi (device-side):

Reminder events: when a scheduled alert fires (timestamp).

Sensor events: when the motor/buzzer/LED is activated and for how long.

User actions: “Taken”(Open/closed Lid), “Snooze”, “Dismiss” (from the phone app command).

Battery telemetry: percentage/voltage (via PiSugar API), charging state, last-low-battery time. (Link to documentation for this: https://www.pisugar.com/blogs/pisugar-blog/display-raspberry-pi-battery-indicator)

Device health: uptime, last sync time.