

3 Project Plan

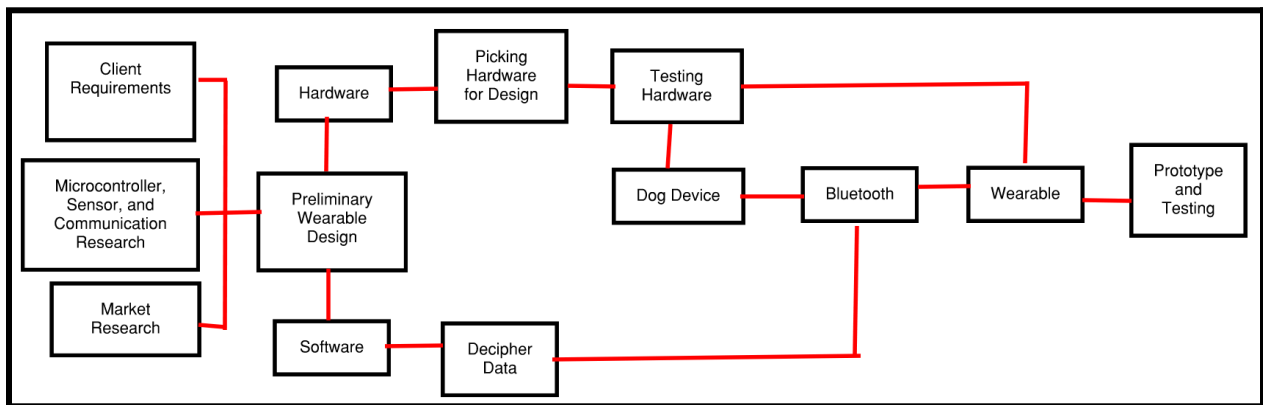
3.1 PROJECT MANAGEMENT/TRACKING PROCEDURES

To increase proficiency we chose to adopt a management style of Hybrid. We chose to use a hybrid project management style during our project. We chose this management style because it is adaptive and accommodates unforeseen challenges. This allows for the opportunity to reflect on previous steps in our project. Using the hybrid management style, we will be able to improve our work based on updated criteria and constraints from our client. The hybrid management style is a combination of waterfall and agile project management that we use to fully meet deadlines.

To maintain organization and track progress, our team will use a work progress chart made in Google Sheets to keep track of our work throughout the course. We will be using GitHub to maintain our work progress for software development.

3.2 TASK DECOMPOSITION

To keep our team on track, we decomposed our tasks into major and sub tasks. This is to ensure we are staying on track and accomplishing all necessary milestones to meet our clients needs with precision and efficiency.



Below is a breakdown of our major tasks.

Hardware:

→ Purchasing any hardware: photoslethymsoqram sensor, microcontroller, haptic vibration sensor, and LEDs.

Software:

→ Interfacing with hardware.

→ Initializing registers, reading data.

Decipher Data:

→ Comparing and contrasting read data to a control group to diagnose if a PTSD episode is imminent.

Dog Device:

→ Includes a microcontroller and the haptic vibration sensor.

Prototype and Testing:

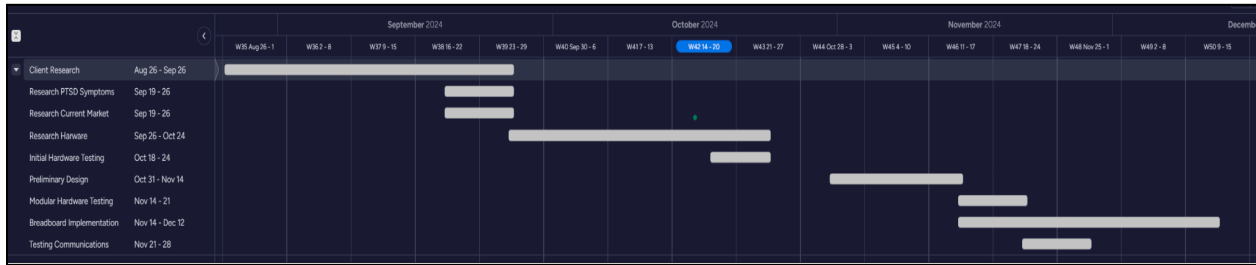
→ Developing functional breadboard prototype to test and verify it functions as wanted.

3.3 PROJECT PROPOSED MILESTONES, METRICS, AND EVALUATION CRITERIA

Illustrating milestones are to help keep our team away of the scope of our project as well as decompose what tasks are necessary for a functional project.

- Research requirements - **10/15/2024**
 - What data needs to be collected from the user
 - Form factor requirements for wearable device
 - How the human-worn device needs to interact with the dog-worn device
 - Functional requirements
 - How fast does the device need to respond to episodes?
 - How should the dog be alerted reliably and humanely?
 - What sensor data is needed to detect an episode?
- Research and order hardware components - **10/31/2024**
 - Evaluate utility of ESP32
 - Look into PPG Sensor
 - Haptic vibration device
 - EKG sensor
 - System batteries
- Begin implementing core programming functionality - **12/17/2024**
 - Interface microcontroller with ppg sensor
 - Write algorithms to analyze ppg data
 - Interface bluetooth connectivity between microcontrollers
 - Output estimation of PTSD attack with > 50% accuracy
 - Enable haptic dog vest vibration within 1 second of PTSD attack detection
- Evaluate and refine accuracy - **02/28/2025**
 - Add new inputs to device to better refine results
 - Perform testing to ensure reliability of data communication
 - Increase performance by improving key metrics such as:
 - Battery life - Battery must be able to operate with device on for > 16 hours
 - Response time - Dog must be alerted within 15 seconds of PTSD attack beginning
 - Accuracy of PTSD event detection - Detect and positively diagnose PTSD attack with accuracy > 90%
- Add additional functionality and create final device layout - **03/31/2025**
 - Push button to control operation of device
 - Easy to use on-off switch for dog device and human device
 - LED indicator to give device state data to user
- Create PCB with final device peripherals, finalize device firmware - **05/13/2025**
 - Device can take in sensor data and diagnose PTSD episodes with high (> 90%) accuracy
 - Device does not produce false positives more than 5% of the time
 - Device is small enough (< 3x3 inches) such that it is comfortable to wear

3.4 PROJECT TIMELINE/SCHEDULE



The Gantt chart above details the projected timeline of our project throughout the fall semester. The first phase of the project is exclusively devoted to client research to clarify exactly what project constraints will be required. This step lets us know what hardware research we need to do in later phases. The next phase would be to research PTSD conditions as well as the current market for devices similar to the one we are creating. Researching PTSD conditions allows us to know what we should be checking for in our clients. Looking into the market for PTSD devices allows us to see examples of ways to improve our design or compare what should be expected from our product. The third phase is researching hardware. The basic hardware research we did was on microcontrollers, Bluetooth, and sensor research. A subcategory of hardware research is initial hardware testing of hardware we have ordered and received. Preliminary design is the fourth phase where we take the components and design a basic prototype for testing. The small subcategory of modular hardware testing pertains to getting our devices to work together. The fifth phase of the project is breadboard implementation where we take the preliminary design and create a working prototype for testing. A subcategory of the implementation phase is testing communications, as our product needs two devices to communicate properly with each other.

3.5 RISKS AND RISK MANAGEMENT/MITIGATION

Risk 1: Veteran or dog device battery running out of charge - 0.9

- Mitigation: Give users an indication of battery status with an LED. Design hardware to be power efficient and easy to charge.

Risk 2: Sensors being too sensitive to motion for accurate data interpretation - 0.4

- Mitigation: Detect motion with a sensor or software data analysis in order to discard invalid data.

Risk 2: Loss of connection between devices - 0.2

- Mitigation: Notify users of any connection interruption with an LED. Train users on best practices with the device to avoid situations where the connection is more likely to struggle.

Risk 4: Dog does not tolerate device vibration: 0.1

- Mitigation: Have different levels of vibration intensity to acquaint the dog with the vibration sensation.

3.6 PERSONNEL EFFORT REQUIREMENTS

Task	Estimated Hours Spent
Client Research	20
PTSD Symptom Research	20

Current Market Research	10
Hardware Research	40
Initial Hardware Testing	20
Preliminary Design	20
Modular Hardware Testing	20
Breadboard implementation	60
Testing Communication	20

3.7 OTHER RESOURCE REQUIREMENTS

Illuminating other resources aside from financial needs, we will need to acquire several other resources to be successful.

Biometric Control Data:

- Receiving data from American VetDogs to accurately detect PTSD attacks.

Computers/Laptops

- This is to interface with our specified microcontrollers IDE's.

Digital Multimeter

- To ensure the electrical integrity of our parts are functioning properly, we need to measure that the values read what we expect.

Contact With Iowa State Veterans

- Once a working prototype exists, we will need to test our device on a test group.