Planning Your Design

You have identified your goal, but there is a lot to do and not much time in which to do it. Having a plan will help. In this phase you will get into the logistics of your project and divvy up tasks. One of the strengths of a team approach is that the individual members can be specialized. For this to work, however, everyone has to be committed to their responsibilities and there must be an accountability structure. The tools in this section will help you to appropriately prioritize tasks, identify every team member's role and plot a direction to your ultimate goal.

This section will guide your through two steps in the design thinking process: empathize and define.

Section 2: Planning

Craft a Preliminary Value Proposition

A value proposition is a statement of the values of a project idea. The value proposition should be crafted from the user's perspective. What are the "pain points" or needs or wants the user has that your project addresses? Writing the proposition helps a team conceptualize the problem space, prioritize project tasks, and explain or pitch the idea to others.

In paragraph form, write a statement articulating the benefits offered by your project, how it will solve an authentic problem, and what distinguishes your project from the competition (i.e., what makes the solution novel).

Our innovative Closed-Loop System for the management of bruxism offers a groundbreaking solution to millions suffering from teeth grinding, a prevalent issue that often leads to severe dental damage and a diminished quality of life. Unlike traditional methods that rely on passive, symptom-driven approaches, our device employs advanced EMG sensors to detect bruxism in real time. Upon detection, it gently vibrates, prompting users to relax their jaw, which not only addresses the immediate discomfort but also trains them to modify their behavior over time.

This proactive system is distinguished by its use of real-time analytics and machine learning technologies that enable it to adapt to individual patterns and provide tailored interventions. By analyzing extensive data on users' habits and environmental factors, the system offers personalized insights that help identify and mitigate potential triggers such as stress or sleep disturbances. This level of customization sets our project apart from conventional treatments that lack personalization and foresight.

Additonally, our solution extends beyond immediate relief, aiming to significantly improve dental health and overall quality of life. Users benefit from reduced pain and discomfort, better sleep, and fewer long-term dental issues, which ultimately leads to lower healthcare costs. The app integration enhances user engagement through visual insights into their progress and trends, fostering an interactive and empowering user experience.

Our project stands out in a competitive market by integrating predictive analytics, which not only detects but anticipates bruxism episodes, enabling preventative care rather than mere symptom management. This innovative approach, combined with the potential for significant healthcare savings and improved patient outcomes, makes our Closed-Loop System a compelling proposition for individuals suffering from bruxism, healthcare providers, and insurers alike.

Skills Gap Assessment

Previously, you assessed the skills represented by your team. Next, you need to identify the skills that you will need to acquire in order to successfully design and prototype your project idea. You will also need to develop a realistic plan for how your team will acquire those skills.

Draw a chart or diagram of the skills that you and your team members have and the skills that will be needed to complete your project.

See page 20 and 21 for diagram of the skills our team has, as well as the skills needed to complete the project. This assessment has already been completed and does not need to be done twice.

Here are the skill areas and our team's current proficiency:
1.**EMG Sensor Integration** - Average Skill Level: 3.4
2.**Mobile App Development** - Average Skill Level: 2.4
3.**Signal Processing for EMG Data** - Average Skill Level: 3.4
4.**Vibration Feedback Mechanism Design** - Average Skill Level: 2.4
5.**Wearable Device Design** - Average Skill Level: 3.0

From these results, it's clear that our team has a moderate understanding of EMG sensor integration, signal processing, and wearable device design. However, there are gaps in mobile app development and vibration feedback mechanism design.

Make a plan for how your team will acquire the skills you need (e.g., consulting online tutorials, code banks, books, expert consultant, etc.).
Be specific, name names, and state preliminary steps. List the first few steps you will take over the next week to start this process.

Plan to acquire skills:

- Take a crash course in mobile app development. Academind has a very well-reviewed video "React Native Crash Course | Build a Complete App". It is only 3.5 hours long. One team member will take this course and lead the mobile app development workstream. https://www.youtube.com/watch?v=VozPNrt-LfE
- For learning about vibration feedback mechanism design, one team member will participate in an online workshop or webinar series on haptic technology and feedback mechanisms, emphasizing rapid prototyping. The following resources are potentially viable:
  - Stanford Webinar: Haptics - Designing for Touch (45 minutes long) https://www.youtube.com/watch?v=ekEpAqP-PxE
  - From Haptic Science to Haptic Technology - Webinar presented by Vincent Hayward (1 hour, 15 minutes long) https://www.youtube.com/watch?v=0hvvIeG6TkM
- I have identified an additional skill we will need: Database systems and data streaming to support the backend of the app. I will most likely seek outside help for this from one of my colleagues who offered to help set up a PostgreSQL database server, and then use a service like Kafka to stream the data. If there is time to set it up on the cloud, we will utilize AWS free tier (https://rb.gy/pedg13) for compute and storage resources. Otherwise, we will run it locally for the purpose of the prototype and demonstration.

Assign roles to each team member. Clearly state the responsibilities associated with each role.

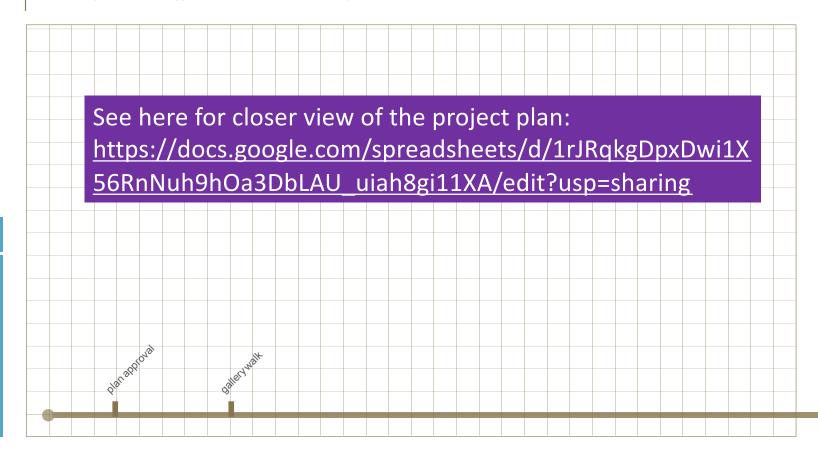| Name	Role(s)	Responsibilities
Emily	**Project Manager**	•Leads discussions about project progress, sets milestones, and assigns tasks. •Monitors budgeting, purchasing, and anticipates potential roadblocks, ensuring project stays on track. •Coordinates study sessions and shares weekly summaries with the team. •Sources additional resources to supplement project materials.
Elijah	**Hardware Engineer** person > device input	•Designs and develops the hardware components necessary to collect and convert data into a digital format. •Works closely with software developers to ensure seamless integration of hardware and software systems. •Reviews the latest FDA regulations applicable to medical device hardware. •Testing and data collection
Aditya	**Hardware Engineer** device input > person output	
Poojitha	**Software Developer** device input > app output	•Develops a Graphical User Interface (GUI) on either a computer or mobile platform for user-friendly data management and visualization. •Conducts weekly presentations on the insights and progress in real-time data processing and UI/UX design. •Collaborates with hardware engineers to ensure software compatibility with data collection devices.
Frenda	**Market Research Analyst**	•Leads market research, conducts interviews, and formulates questions to better understand customer needs and market gaps. •Drafts initial patent strategies and conducts literature reviews on materials used in similar medical devices. •Researches and contacts potential investors, presenting market analysis and product potentials.

Section 2: Planning

Team Project Plan

Before you go any further, your team needs to agree upon a plan. This plan should be informed by the Value Proposition that you crafted earlier; it will help you to create and prioritize your milestones. Your plan should include a timeline, deliverables, and who is accountable for them.

You should anticipate that not everything will go to plan. Structuring fallback points into your project plan allows you to think through multiple backup plans now before you get too deep into the process. It is also important to identify a date by which you will make a course correction (when you will fallback) if your original plan does not work. Your plan will not be approved until these elements are in place.

See here for closer view of the project plan:
https://docs.google.com/spreadsheets/d/1rJRqkgDpxDwi1X56RnNuh9hOa3DbLAU_uiah8gi11XA/edit?usp=sharing

plan approval

gallery walk

BIOEN/EE 461/561 GANTT CHART

PROJECT TITLE	MyoGrind: A Wearable EMG Device for Bruxism		CLASS NAME	Neural Technology Studio
PROJECT MEMBERS	Emily Rodgers, Elijah McReeb, Aditya Krishna, Frenda Lin, Poojitha Arangam		DATE	4/14/24

WBS NUMBER	TASK TITLE	TASK OWNER	START DATE	DUE DATE	DURATION	PCT OF TASK COMPLETE
1	**Project Conception and Initiation**					
1.1	Surveying Skills and Project Fit	Emily	4/1/24	4/8/24	7	100%
1.2	Submit Final Project Decision	ALL	4/1/24	4/8/24	7	100%
1.3	Design Gallery Walk Poster	ALL	4/8/24	4/15/24	7	100%
1.4	Develop Project Timeline	ALL	4/8/24	4/15/24	7	100%
1.5	Assign Roles and Responsibilities	Frenda	4/15/24	4/17/24	2	100%
2	**Market Analysis**					
2.1	Shortlist 5 Interview Candidates	ALL	4/15/24	4/16/24	1	0%
2.2	Design Interview Script/Questions	Frenda	4/15/24	4/17/24	2	0%
2.3	Interview Candidates	ALL	4/17/24	4/23/24	6	0%
2.4	Interview Response Analysis	Emily	4/19/24	4/22/24	3	0%
3	**Prototype Development**					
3.1	Preliminary Hardware System	Elijah	4/22/24	5/3/24	11	0%
3.2	EMG Detection Software	Aditya	4/22/24	5/6/24	14	0%
3.3	Preliminary User Control App	Poojitha	4/29/24	5/6/24	7	0%
3.4	Hardware + Software Integration	Aditya/Elijah	4/29/24	5/10/24	11	0%
3.5	Midterm Presentation Preparation	Emily/Frenda	4/29/24	5/10/24	11	0%
3.6	EDN Notebook Responsibilities	Emily/Frenda	4/22/24	5/10/24	18	0%
4	**Compliance and Testing**					
4.1	Polished Hardware System	Elijah	5/12/24	5/16/24	4	0%
4.2	Advanced Analysis / Troubleshooting	Aditya	5/12/24	5/16/24	4	0%
4.3	Polished User Interface	Poojitha	5/12/24	5/16/24	4	0%
4.4	Testing on users + Designing Demo	Poojitha/Aditya/Elijah	5/17/24	5/26/24	9	0%
5	**Go-to-Market Stategy**					
5.1	Draft Project Report; What More Needs To Be Done?	Frenda/Emily	5/13/24	5/24/24	11	0%
5.2	Project Demo Prep	Elijah/Poojitha/Aditya	5/27/24	6/5/24	8	0%
5.3	Final Project Presentation Prep	Emily/Frenda	5/27/24	6/5/24	8	0%
5.4	Final Project Presentation	ALL	5/27/24	6/6/24	9	0%

Week columns: WEEK 2 (4/1 - 4/5), WEEK 3 (4/8 - 4/12), WEEK 4 (4/15 - 4/19), WEEK 5 (4/22 - 4/26), WEEK 6 (4/29 - 5/3), WEEK 7 (5/6 - 5/10), WEEK 8 (5/13 - 5/17), WEEK 9 (5/20 - 5/24), WEEK 10 (5/27 - 5/31), WEEK 11 6/3 - 6/7), WEEK 12 (6/10 - End)

slide presentation

pitch and demo

documentation

Section 2: Planning

You have a project within your team project. Use your Team Project Plan to guide you in developing an individual project plan. This plan should include your own timeline, deliverables, and a diagram.

BIOEN/EE 461/561 GANTT CHART

Smartsheet Tip ➔ A Gantt chart's visual timeline allows you to see details about each task as well as project dependencies.

| PROJECT TITLE | MyoGrind: A Wearable EMG Device for Bruxism | CLASS NAME | Neural Technology Studio |
| PROJECT MEMBERS | Emily Rodgers | DATE | 4/15/24 |

WBS NUMBER	TASK TITLE	TASK OWNER	START DATE	DUE DATE	DURATION	PCT OF TASK COMPLETE
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2.1	Shortlist 5 Interview Candidates	ALL	4/15/24	4/16/24	1	0%
2.3	Interview Candidates	ALL	4/17/24	4/23/24	6	0%
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3.6	EDN Notebook Responsibilities	Emily/Frenda	4/22/24	5/10/24	18	0%
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5.3	Final Project Presentation Prep	Emily/Frenda	5/27/24	6/5/24	8	0%
5.4	Final Project Presentation	ALL	5/27/24	6/6/24	9	0%

See here for a closer view of my individual project plan:
https://docs.google.com/spreadsheets/d/1rJRqkgDpxDwi1X56RnNuh9hOa3DbLAU_uiah8gi11XA/edit#gid=1009699568

Section 2: Planning