

Mission Statement:

This project is to enhance my understanding and provide hands-on experience in the field of biomedical engineering (BME). Through research assessments, interviews, and networking with professionals, I have gained insight into the BME industry and discovered that the development and release of products are lengthy processes due to stringent FDA regulations. Since BME involves designing tools that interact with the human body, every product must be meticulously planned and function flawlessly.

The goal of this original work is not to create a fully finished product within four months but to collaborate with my mentor to develop a functional prototype while expanding my knowledge of the industry. This project will also offer a closer look at how businesses within BME operate.

Introduction to My Original Work:

I have established a connection with the CEO of Precigenetics, Parmita Mishra, a company focused on real-time biological data collection and processing. This partnership will allow me to explore the biomedical engineering sector, uncover cutting-edge technologies in the market, and understand how to build a successful company in this space. As part of this project, I will work alongside Precigenetics to develop a prototype that will contribute to their eventual market-ready product. Ms. Mishra is facilitating introductions to other professionals within her company and the broader BME industry, offering invaluable opportunities for my growth within the field.

The Product:

The product I aim to prototype is designed to capture real-time data, providing more accurate and efficient results compared to traditional static testing methods. This data collection will allow healthcare professionals to deliver more precise and timely treatments to patients. The end goal is to create a scalable, market-ready solution that integrates seamlessly into the healthcare system, whether for drug discovery, clinical decision-making, or patient monitoring. The strategy for market entry includes forming partnerships with medical professionals, biotech companies, and clinical institutions to pilot the product and establish its credibility in the field.

How It Works:

The prototype will rely on sensors to detect subtle biological fluctuations, which will then be processed by high-speed algorithms and converted into raw signals. These signals will be translated into meaningful data, analyzed by machine learning models that evolve over time to enhance accuracy and predictive capabilities. The device will integrate with existing healthcare systems, such as electronic medical records (EMRs) and diagnostic tools, to ensure interoperability. I will focus on developing the hardware prototype using platforms like Fusion 360 and CAD to design a draft of the product. My role will involve integrating hardware components, including sensors, and contributing to the product's overall development.

Importance of the Product in the Industry:

This product addresses critical issues in the healthcare industry, including delayed diagnoses and imprecise treatments. By collecting real-time data and continuously adapting to incoming information, the focus shifts from reactive to anticipatory care,

marking a significant improvement in the current healthcare system. The product's potential applications span various fields, such as early disease detection, personalized therapies, and efficient drug manufacturing. Continuous insights could revolutionize the biomedical engineering sector.

Business Insights:

Collaborating closely with Precigenetics' CEO will provide me with a comprehensive understanding of both the technical and business aspects of the BME industry. I will gain insights into:

- **Revenue Models:** Understanding how Precigenetics generates income, including licensing technology, securing investments, and forming partnerships with pharmaceutical and biotech companies.
 - **Stakeholder Relationships:** Observing the company's interactions with medical professionals and institutions, learning how clinical trials and regulatory challenges are navigated, and how credibility is established in the medical field.
 - **Start-Up Dynamics:** Gaining insight into the unique challenges and opportunities faced by BME startups, such as navigating regulatory pathways, securing funding for R&D, and forming strategic partnerships to gain traction in the healthcare market.
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Methodology:

To accomplish the objectives of this project, I have designed a structured methodology:

1. Mastering CAD and 3D Modeling:

- Leverage resources to learn CAD software, particularly Fusion 360.

- Create 3D models to build proficiency in designing functional components for the prototype.
- Explore different design iterations to ensure the prototype is both efficient and scalable.

2. Understanding the Biomedical Engineering Industry:

- Conduct thorough research on current trends, advancements, and challenges within the biomedical engineering field.
- Stay informed on emerging technologies and regulatory frameworks, including FDA requirements.

3. Observing Professional Dynamics:

- Study how professionals interact in formal settings, such as meetings and collaborative discussions.
- Analyze how cross-disciplinary teams work together to move products from concept to market.

4. Prototyping and Iteration:

- Develop several drafts of the prototype, refining each iteration based on functionality and feedback.
- Gain hands-on experience integrating components and troubleshooting design challenges.

5. Comprehending Product Integration:

- Learn about the individual parts of the product and their specific functions.
- Investigate how these components work together to create a cohesive and efficient system.

Materials:

This project will not incur any cost, as all tools and platforms required are being provided by my mentor. The prototype will be built using online tools and software, which have been arranged by my mentor. The primary software I will use for this project is Fusion 360, which will allow for comprehensive design and modeling throughout the process.

Conclusion:

This project offers an exceptional opportunity to immerse myself in the biomedical engineering field, combining theoretical knowledge with practical experience. By collaborating with Precigenetics and under the mentorship of Ms. Parmita Mishra, I will gain a holistic understanding of both the technical and business sides of the industry. The real-time data collection prototype I am developing aims to address some of healthcare's most pressing challenges, including delayed diagnoses and imprecise treatments.

While the primary goal is not to produce a fully market-ready product in just four months, this project will equip me with the knowledge and skills necessary to design, prototype, and iterate on innovative biomedical technologies. Using advanced tools like Fusion 360 and CAD, I will develop a functional draft that could one day revolutionize the healthcare industry.

Ultimately, this experience will broaden my understanding of the biomedical engineering landscape and help me grow as both an engineer and a future professional in the field. By combining technical learning with business insights, I will be better prepared to navigate the complexities of the biomedical industry, from product development to market implementation.

Calendar/Timeline:

Jan 24th - Feb 1st:

- Complete the Fusion 360 course to gain proficiency in CAD software and 3D modeling.
- Take detailed notes throughout the course to enhance learning.
- Schedule a meeting with Mr. Nahas for **Feb. 2nd** to review progress and define next steps for the project.

Feb 1st - Feb 5th:

- Schedule a meeting with Ms. Parmita Mishra at her earliest convenience.
- Discuss the research topics she suggested and have a focused conversation on current trends and challenges in the biomedical engineering (BME) industry.
- Coordinate a time to join a meeting with Parm and other professionals to observe and gain insights into the business dynamics and technological advancements in the industry.