

Omnicore Technologies: Affordable Prosthetic Arm (ID: 42825096)

Introduction: The inspiration for this project came from one of our members whose close friend was in need of a functional prosthetic arm that they couldn't afford. The use of a prosthetic can greatly improve the quality of life for those in need by allowing them to **engage in previously difficult activities** and help them in **rehabilitation**. However, prosthetics can be **prohibitively expensive**. Consider a 21st-century low-cost arm prosthetic that is remote and voice-controlled, with more advanced wrist mechanisms that **mimic a human wrist** while providing additional benefits. Though it appears too good to be true, Omnicore Technologies' newly designed prosthetic arm may be exactly what medical professionals are looking for.

Problem Statement: A study by Ohio State University estimates that **100 million people globally** need a prosthetic limb due to amputation or damage to their arm. However, **80%** of these individuals, many of whom are low-income, **do not have access to prosthetic services**. In recent years, the increasing incidence of sports injuries and road accidents, as well as the rising number of diabetes-related amputations and the growing prevalence of osteosarcoma (bone cancer) around the world, have all contributed significantly to the demand for prosthetics. The North American prosthetic market alone is projected to increase by a 3.8% compound annual growth rate (Grand View Research). Our product aims to provide a cost-effective solution for arm prosthetics that are also modern and technologically advanced. Current human prosthetic solutions can be **impractical**: many are too bulky or have a limited range of motion. Arm prosthetics, in particular, do not prioritize the **functionality and movement of the wrist**, a joint whose mobility is critical for performing daily tasks.

Innovative Solution and Unique Value: Omnicore Technologies arm prosthetic has an especially advanced wrist mechanism (AWSOM: Active Wrist Mechanism Utilizing Spherical Gears and a



One-Drive Mechanism) that we developed, which has been awarded the U.S. Airforce grant and was nationally recognized. AWSOM enables 3 Degrees of Freedom (DoF) movement in a **compact** and **reliable** form factor by utilizing a triple-cross engraved spherical gear structure and a unique monopole driving gear. The meshing of the gears, in addition to the repositioning mechanism, allows us to achieve 3 DOF while maintaining a cheaper and simpler form factor.



Furthermore, our arm can reach 7 DoF with the addition of the Elbow Flexor, Humeral Rotator, Shoulder Flexor, and Shoulder Abductor joints within the shoulder configuration. Our goal is to make our prosthetic arm **5 times cheaper** than comparable arm prosthetics on the market. Omnicore Technologies arm prosthetics are easy to assemble and maintain due to their streamlined design and 3D printable parts. Although there are numerous other arm prosthetics on the market, **none have a wrist mechanism as advanced** as Omnicore at our price point. Even after many years of development, the 6 DoF high-end Luke Arm system costs more than **\$200,000** and is still



not on the market today. Lower-end arm prosthetics like the Hero Arm and Ottoblock Arm, which lack 3 DoF wrist mobility, still cost more than **\$10,000**.

Business Model + Economic Sustainability:

1.) <u>Prototype Development</u>: Omnicore Technologies has already designed and produced a prosthetic wrist/feeder (arm) prototype using 3D printing technology, costing **\$200**. We also designed a website (www.omnicore.tech) to demonstrate the features of our product. The powerful and complex 3 DoF wrist movements are controlled by a RISC-V-based development board and our custom drivers. In the next two months, we will build the prototype of the prosthetic arm by connecting the 3 DoF prosthetic wrist to a prosthetic hand, and a human arm through 3D printed connectors by hiring:

A mechanical engineer to work with ETSY to design (\$4/per design) and 3D print the prosthetic hand or buy the prosthetic hand from the market (\$100 cost from e-NABLE), 3D print the connectors (\$130) from prosthetic wrist/feeder to human arm and to the prosthetic hand. After the prototype demonstration of the prosthetic arm, we plan to pattern the assembled prosthetic arm with the innovative prosthetic wrist design.

A software engineer to design apps with voice control of the prosthetic arm movement.

An orthopedic doctor will offer user experience and customer feedback on the prosthetic arm prototype after try-out.

Assuming the average market salary of the professionals above is around \$200K per year, the prototype development cost will be approximately **\$100K**.

2.) <u>Volume Production</u>: Omnicore Technologies plans to make its software package available for a monthly fee of \$100 on the IOS and Android App Stores following the successful demonstration of the prototype. To optimize the assembly process and further develop the



software, we will hire one software engineer, two assembly technicians, and one mechanical engineer. The assembly technicians will work daily to assemble the parts and test the high-volume production process, aiming to achieve an assembly yield of around 90% within four weeks of setting up the process. Each technician will assemble approximately 8 prosthetic arms per day, resulting in a total of 320 products during the 4-week volume production period. The labor and material costs for this process will be \$20,000 for the software engineer, \$10,000 for the two assembly technicians, and \$138,500 (\$430×320) for materials. The initial promotion of Omnicore Technologies will offer these 320 products at a price of **\$530** each, meaning we only need to generate **\$170,000** in revenue to cover all costs.

3.) <u>Market Size</u>: According to the Ohio State University Study, approximately 2.1 million people live with limb loss in the USA. Based on this data, half of this group (about 1.05 million people in the USA) need prosthetic arms throughout their lifespan. Assuming the average life span of a U.S. citizen to be around 80 years, there are about ½ of retirees between 70-80 and ½ of people between 5-15 who are in need of affordable prosthetic arms, which makes the demand to about **250K per 10 years, or 25K per year.** In summary, we are more specifically targeting ¼ of the USA age groups prioritized on their affordability.

4.) <u>Projected Annual Revenue and Profit</u>: Assuming the assembly tech works 50 weeks per year, the volume production per tech per year is **2000 units** (8 units/day)×(5 days/week)×(50 weeks/year), which indicates we need about 14 full-time techs to deliver 25K prosthetic arms with an 89% production yield. The tech labor cost per year adds up to **\$840K** ($$60K\times14$). Regarding continuous technology development, we will need one full-time software engineer, mechanical engineer, assembly process engineer, and market analyst, with a total labor cost of about **\$800K** ($$200K\times4$) per year.



We also need to rent an assembly factory to accommodate 14 techs: with the current Arizona rent rate (\$25/ sq feet/ month), there is a total **\$270K** rental cost per year on a 900 sq foot factory. The materials cost for 25K prosthetic arms per year is **\$10,750,000/year** ($$430\times25K$). We will set the target price of our prosthetic arms to an affordable **\$1K/unit**, which is much lower than the cheapest functional prosthetic arms on the market of **\$5K/unit**. This sets our annual revenue at **\$25,000,000** (**\$1K**×25000). To calculate the profit, we subtract labor and materials cost from the revenue: **\$25,000,000** - **10,750,000** - **840,000** - **800,000** - **270,000** = **\$12,340,000** (Profit Margin of 49.36%)

5.) <u>Market Expansion</u>: Because the U.S. population accounts for less than 5% of the global population, the global market is 20 times larger. Omnicore Technologies can transfer our product assembly process to any country. We can maintain a similar profit margin to the U.S. and reduce costs while maintaining product quality as long as we have factories worldwide replicating the exact assembly process at our U.S. headquarters. Finally, the potential for growth and global profit is estimated to be **\$246,800,000** (\$12,340,000×20).

Our Vision: Our mission is to empower individuals with upper limb loss to live their lives to the fullest by providing them with functional yet affordable prosthetic arms. We are committed to constantly improving our products to ensure the best possible outcomes for our clients. Omnicore Technologies' affordable prosthetic arm can change the lives of hundreds of thousands of older and disabled people worldwide in need of our products for the better by improving not only their physical states but also their emotional and mental states. Our clients will be happier than ever and have the opportunity to spend more time with loved ones, doing sports and activities that they love with the help of our prosthetic arm. By partnering with other prosthetic and medical/industrial robot companies, we have the opportunity to elevate our model's visibility, bringing it within reach for those who need it most.