NUST's Myobionic Prosthetic Hand: A Triumph Of Pakistani Innovation Empowering Those With Limb Loss And Transforming Healthcare

National University of Sciences and Technology

The development of bionic prosthetic limbs has revolutionized the field of assistive technologies, allowing individuals to regain functionality and autonomy in their daily lives. The National University of Sciences and Technology (NUST) has developed a cutting-edge Myobionic upper limb prosthetic hand, designed and created entirely in Pakistan to provide an affordable, high-quality solution for persons with upper limb loss. This groundbreaking achievement positions Pakistan at the forefront of assistive technology, addressing a critical need within the country and offering immense potential for global impact. Spearheaded by researchers Dr. Umar Shahbaz Khan, Tenured Professor at Department of Mechatronics Engineering and Project Director of the National Centre of Robotics and Automation (NCRA), and Prof. Dr. Mohsin Tiwana, Co-PI NCRA Robot Design and Development Lab, the Myobionic hand represents not just a technological advancement but also a beacon of hope for people with limb loss, reflecting NUST's mission to leverage technology for societal good.

The Myobionic hand employs cutting-edge electromyography (EMG) technology, allowing users to control prosthetic movements intuitively through electrical signals generated by their muscles, offering a seamless and thought-driven experience. When the muscle contracts it sends a desired signal to the gripper to accomplish the essential movements. EMG sensors detect the electrical activity generated by muscle tissues during contraction. When an individual with an amputated limb attempts to move their missing hand, the residual muscles in the upper arm or forearm still produce electrical signals. These EMG sensors capture these signals, which are then translated into commands to control the movements of the robotic hand. This innovative approach surpasses traditional prosthetics (cosmetic prostheses, and body-powered prostheses) in Pakistan by offering a wider range of motion, precise grip control, and the capability to perform complex tasks. By enabling everyday activities like eating, dressing, and writing, this hand empowers individuals to reclaim their autonomy, participate more fully in society, and pursue their livelihoods without limitations. Its lightweight, durable, and customizable design ensures practicality and versatility, catering to the specific needs of each user.

Beyond its technological advancement, the Myobionic hand aligns with several UN Sustainable Development Goals, particularly (SDG) 3: Good Health and Well-being, and SDG 10: Reduced Inequalities. By providing access to affordable and advanced assistive technology, NUST is enhancing the physical and mental well-being of those with limb loss, allowing them to lead healthier, more fulfilling lives. It also fosters inclusiveness by breaking down barriers for people with disabilities and ensuring equal education, employment, and social participation opportunities.

From Lab to Life: NUST's Tech Transfer Success Story

NUST's commitment to translating research into real-world solutions is evident in the Myobionic hand's successful commercialization. The NUST technology transfer office (TTO) played a pivotal role in the successful transfer of intellectual property and commercialization of this innovation. NUST facilitated collaboration in **2022** between its spinoff company, Robotiqs Pvt Ltd, and the Armed Forces Institute of Rehabilitation Medicine (AFIRM) to ensure a seamless transition from research to a market-ready product. Moreover, **5 x intellectual property rights safeguarding this innovation**, demonstrating the university's commitment to responsible technology transfer.

According to the estimation of the World Health Organization (WHO), 650 million individuals suffer from disability worldwide. About 80% out of 650 million individuals reside in developing countries. Among 650 million, approximately 3 million suffer from upper limb amputation, and 2.4 million of them live in developing countries. The rehabilitation services to overcome disability by using prostheses are so uncommon and expensive that only 3% of persons with limb loss in developing countries have access to them. According to another survey conducted in 2021, there are about 200,000 annual amputations in Pakistan. We have specifically developed this product for those with upper limb loss. The device has been successfully applied in real-world settings, with **three test subjects** initially provided with the prosthetic limb **free of charge reporting successful usage**. Since then, **eight additional customers** have procured the device, demonstrating its effectiveness and appeal as a commercialized product.

Social Impact in Pakistan

The Myobionic hand holds significant economic implications for Pakistan. Offering a locally

produced, high-quality alternative to expensive imported prosthetics, alleviates the financial burden on individuals and the national healthcare system. Its affordability and accessibility are set to transform the prosthetics market, making advanced technology available to a broader population.

Competitor Analysis

When it comes to local alternatives, most options are body-powered prosthetics or 3D-printed limbs, but they don't come close to what Myobionics offers. The Myobionics hand uses a metallic gripper and advanced EMG technology, making it far more sophisticated. International products like Myobock, I-Limb, and Be-bionics are excellent but come with hefty price tags, long waiting times for imports, and high repair costs (Expensive after-sales services), making them out of reach for most people in Pakistan.

Financial Impact on Pakistan's Market and Economy

By producing these prosthetics locally, Pakistan has reduced its dependence on expensive imports, making these devices more accessible to those who need them most. Local manufacturing has driven down prices by 5-6%, bringing life-changing technology within reach for more people.

Looking ahead, Pakistan's ability to create and produce advanced medical devices like the Myobionic prosthetic hand opens up exciting opportunities for exporting these innovations abroad. This could bring in valuable revenue, helping the country establish itself in the global medical technology market while also diversifying the economy. Through initiatives like the Myobionic hand, NUST continues to demonstrate its enduring commitment to innovation, social responsibility, and positive change in Pakistan and beyond!

This story was originally published in 2025.