



## Proper prosthetics

3D printing is transforming lives with better fitting and better looking prosthetics that can be produced more quickly.

New prosthetics can cost anywhere between \$5,000 to \$50,000, with high-end options costing up to \$100,000. And even top-of-the-line prosthetics have to be replaced after only three to five years of wear, more frequently for growing children.

Even if one can afford the thousands of dollars, The World Health Organisation (WHO) estimates there is a shortage of 40,000 trained prosthetists to meet the demand.

### REINVENTING PROSTHETIC MANUFACTURING

A few years after he was first fitted with his prosthetics, Christopher Hutchison's legs swelled while he was on a long-haul flight, causing his sockets to tighten. Blood flowed into his legs, but not out. Christopher and his father founded ProFit in 2013 to produce better prosthetic sockets.

Based in Bulgaria, ProFit uses 3D printing technology to transform the manufacturing process of customised

prosthetic sockets for a more comfortable and faster fit. Rapid improvements in 3D scanning technology, critical to the process of 3D printing prosthetics, have helped to speed the process up and drive costs down. Scanners are being built into smartphones as high-megapixel cameras become increasingly affordable. "You can basically do a 3D selfie," says Lee Dockstader, director of vertical development for HP's 3D printing businesses.

ProFit in Europe and Unlimited Tomorrow in the U.S. sees the potential of 3D printing to take printed prosthetics to an industrial level with improved quality, more complexity of printed products and reduced turnaround from weeks to a matter of days.

"When you drive the part cost down and make the ease of access easier, it drives adoption up," says Dockstader.

While Unlimited Tomorrow and ProFit both make prosthetics accessible to remote and underprivileged communities, Print My Leg's Christophe Debard aims to elevate the aesthetics of prosthetic limbs.



## PERSONALISING PROSTHETICS

For Debard, an amputee since age 13 as a result of cancer, 3D printing makes possible a years-long goal: unique prosthetics that make a statement of personal identity.

For years, Debard, an engineer at Airbus based in Toulouse, France, had met people who felt uncomfortable revealing their prosthetics. “They prefer to hide it,” he says, “wearing long pants even in the summer.”

The problem with prosthetics, Debard thought, is that they try, unsuccessfully, to look like a real limb. “It gives others the impression that you want to hide it, but everybody can see that it’s not real,” he says.

Debard takes a scan of an amputee’s intact leg to approximate a similar leg volume for the prosthetic limb. He then designs interchangeable covers to envelop the prosthetic leg, giving it a fuller look.

Next, the covers are customized with unique designs and decorations—leaves for the plant enthusiast, for example, or a geometric pattern. The hull, or cover, is then then 3D printed.

## THREE COMPANIES TRANSFORMING PROSTHETICS MANUFACTURE

**Profit** – founders Christopher and father Alan Hutchison have set an ambitious goal of creating 3D printed prosthetic sockets for 20 million amputees.

**Print My Leg** – produces custom and personalised prosthetic covers that are functional and beautiful.

**Unlimited Tomorrow** – uses 3D printing to produce custom artificial prosthetic devices at an affordable cost, making advanced artificial limbs accessible to remote and underprivileged communities at the end of product life.

Now, Debard’s goal is to make this customisation process more widely accessible. He plans to collaborate with e-NABLE, a global network of volunteers who use their 3D printers, design skills and personal time to create free 3D printed upper-limb prosthetics for those in need, particularly in underserved communities.