

The Need for Prosthetic Care

For people missing an upper-limb, the lack of prosthesis may be a major disability that can negatively affect their quality of life. Many developing countries lack the proper resources to help disabled citizens. Prosthetic care is expensive and requires trained individuals (prosthetists) to provide proper care to the people in need. According to the World Health Organization (WHO), 80% of amputees live in low-income countries yet only 5% of them have access to prosthetic care [1]. Missing limbs can lead to low self-esteem, social exclusion from the community, and can be a burden to the supporting family. Further, it can make it difficult to gain and keep employment. Everyday tasks such as

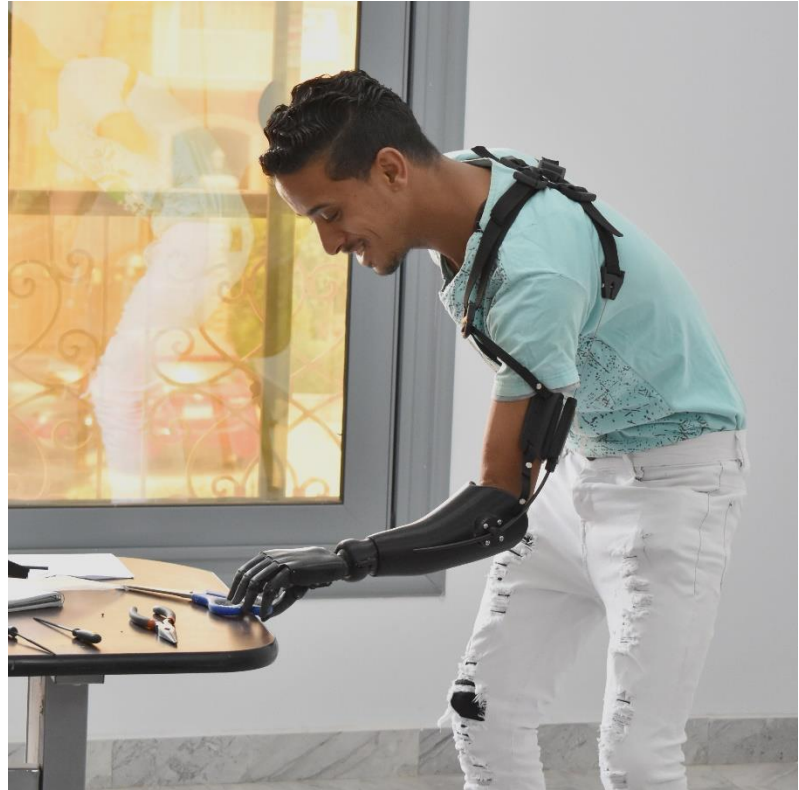


Figure 1 Bilateral amputee, Mostafa, learning how to use the Victoria Hand in Egypt

eating, cooking, dressing, and washing may become challenging to complete. Conventional upper-limb prosthetic devices can cost between \$2,000 [2] and \$5,000 [3] USD for parts alone. This is too expensive for many people in the developing world, especially those who cannot find work.

VHP's Solution

Just \$240 USD provides a prosthetic arm to an amputee in a developing country

The Victoria Hand Project (VHP) is a Canadian non-profit organization founded in July 2015, with a mission to provide upper-limb prosthesis to amputees in developing countries with limited or no access to prosthetic care. VHP has created the Victoria Hand System: a series of body-powered prostheses that allow amputees to do home and work-related tasks, and to improve their quality of life.

VHP’s approach has three key features:

- (1) Setup of a production/fabrication center and assembly training to make these 3D printed prostheses on-site within developing countries;
- (2) Training and working with clinical intermediaries and medical practitioners to provide professional care for amputees;
- (3) On-going operations support for both the production center and the clinical provision network.

Just \$240 USD provides a prosthetic arm to an amputee in a developing country. This includes the cost of materials (\$80), the Clinical Care Group’s cost (\$80), and 3D Print Group’s cost (\$80). The Victoria Hand Project is currently working in 7 developing countries: Nepal, Cambodia, Guatemala, Ecuador, Haiti, Egypt, and Uganda. VHP has fit over 120 amputees within the 7 partner countries and in Canada.



Figure 2 Comparison of traditional upper-limb prostheses to the Victoria Hand



Figure 3 Palpasha was fit with a Child's Hand in June 2019

VHP’s Technology

3D printing is used since it allows the devices to be printed on-demand, on-site in the country. 3D scanning is used to capture the unique shape of the individual’s limb, to thereby 3D print a customized socket for that user. The Victoria Hand is a complete prosthetic system, which includes the hand, the wrist unit, the custom forearm socket, and a harness to actuate the device. VHP has the capabilities to fit amputees who are trans-radial (below elbow loss), trans-humeral (above elbow loss), and children with trans-radial loss. VHP has also adopted a US non-profit named LimbForge Technologies, who make 3D-printed cosmetic arms.

History of VHP

The Victoria Hand is based off the TBM Hand, which was designed by VHP's Executive Director, Nick Dechev, during his Master's at the University of Toronto in 2001. This hand was very expensive to produce since it used traditional manufacturing techniques, such as milling. The hand was re-designed for 3D printing and was tested in Guatemala in 2014 as part of University of Victoria research. The need for accessible prosthetic technology in developing countries was discovered at this time and the idea of the Victoria Hand Project was devised. The Victoria Hand Project became incorporated as a not-for-profit in 2016. In Summer 2016 VHP expanded to Nepal and Cambodia after receiving funding from Grand Challenges Canada, and to Haiti with help from LimbForge (Enable Community Foundation at this time). In 2017, VHP received \$250,000 CAD from the Google Impact Challenge Canada. This has allowed VHP to expand operations to both Egypt and Uganda, as well as continue operations in the 5 other countries.



Figure 4 The LimbForge Cosmetic Arm

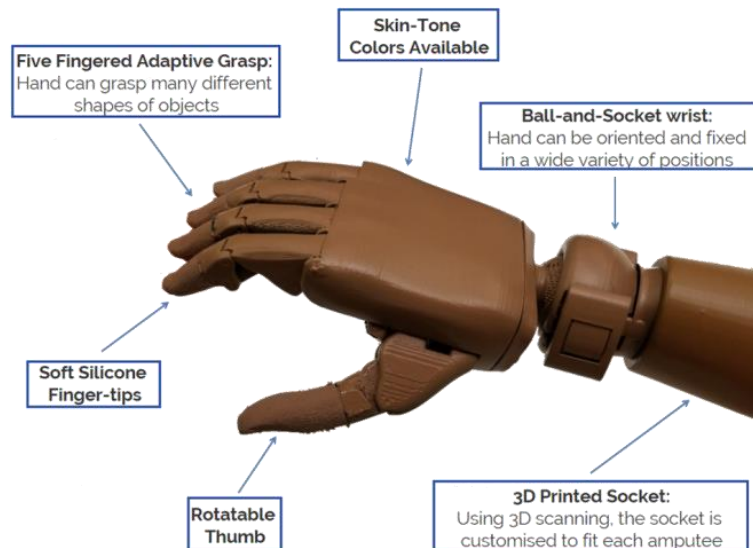


Figure 5 The Victoria Hand System



For more information on the Victoria Hand Project:



<http://www.victoriahandproject.com>



www.facebook.com/victoriahandproject



[@victoriahandprj](https://twitter.com/victoriahandprj)



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References

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- [2] "AOPA Statement on 3-D Printing in Prosthetics and Frequent Errant Estimates of the Average Cost of Upper and Lower Limb Custom-Fabricated Prosthetic Devices", American Prosthetic and Orthotic Association, Online, Feb 2015, <http://www.aopanet.org/2015/02/aopa-statement-on-3-d-printing-in-prosthetics-and-frequent-errant-estimates-of-the-average-cost-of-upper-and-lower-limb-custom-fabricated-prosthetic-devices/>
- [3] "How Much Does a Prosthetic Arm Cost?", CostHelper, 2017. [Online]. Available: <https://health.costhelper.com/prosthetic-arms.html>. [Accessed: 28- Jun- 2019].