GLOBAL INFORMATION SOCIETY WATCH 2019

Artificial intelligence:
Human rights, social justice and development

Association for Progressive Communications (APC),
Article 19, and Swedish International Development Cooperation Agency (Sida)

Global Information Society Watch

2019

Global Information Society Watch 2019
Artificial intelligence: Human rights, social justice and development

Operational team
Valeria Betancourt (APC)
Alan Finlay (APC)
Mallory Knodel (ARTICLE 19)
Vidushi Marda (ARTICLE 19)
Maja Romano (APC)

Project coordination team
Valeria Betancourt (APC)
Cathy Chen (APC)
Flavia Fascendini (APC)
Alan Finlay (APC)
Mallory Knodel (ARTICLE 19)
Vidushi Marda (ARTICLE 19)
Leila Nachawati (APC)
Lori Nordstrom (APC)
Maja Romano (APC)

GISWatch 2019 advisory committee
Namita Aavriti (APC)
Rasha Abdul Rahim (Amnesty International)
Alex Comninos (Research ICT Africa)
Malavika Jayaram (Digital Asia Hub)
J. Carlos Lara (Derechos Digitales - América Latina)
Joy Liddicoat (Centre for Law and Emerging Technologies, University of Otago)
Andrew Lowenthal (EngageMedia)
Micaela Mantegna (Geekylegal/Machine Intelligence Lab, Center for Technology and Society, San Andres University)
Valeria Milanes (Asociación por los Derechos Civiles)

Project coordinator
Maja Romano (APC)

Editor
Alan Finlay (APC)

Assistant editor and proofreading
Lori Nordstrom (APC)

Publication production support
Cathy Chen (APC)

Graphic design
Monocromo

Cover illustration
Matías Bervejillo

We would like to extend a special note of thanks to a number of authors who have made ad honorem contributions to this edition of GISWatch.
We gratefully acknowledge the following:

Philip Dawson and Grace Abuhamad (Element AI)
Anita Gurumurthy and Nandini Chami (IT for Change)
Rasha Abdul Rahim (Amnesty International)

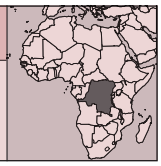
APC would like to thank the Swedish International Development Cooperation Agency (Sida) and ARTICLE 19
for their support for Global Information Society Watch 2019.

Published by APC
2019
Printed in USA

Global Information Society Watch 2019 web and e-book
ISBN 978-92-95113-13-8
APC Serial: APC-201910-CIPP-R-EN-DIGITAL-302

CONGO, DEMOCRATIC REPUBLIC OF

3D PRINTING GIVES HOPE TO AMPUTEES LIVING IN POVERTY IN THE DRC



Mesh Bukavu Network
Pacifique Zikomangane
www.meshbukavu.org

Introduction

Despite the presence in its soil of almost all the minerals used in the new technology industry, the Democratic Republic of Congo (DRC) is far behind in terms of new technology, particularly in the field of robotics, which is very advanced elsewhere in the world.

To this first paradox is added a second. Despite the existence of several universities in the country at which computer science studies are offered, students from these institutions are clearly out of step with several recent developments in their field of study. For example, this is the case with 3D printing technology, which is very popular today in the medical, aerospace and automotive sectors.

In this report, we will talk about the "3D Prosthesis Project",[1] which is a project to manufacture artificial limbs using a 3D printer for people who have had their limbs amputated. Given the level of automation and reprogrammability in 3D printing, many consider it a growing field of robotics engineering.[2] This is a project by the Institut Français de Bukavu (French Institute of Bukavu) in partnership with Ciriri Hospital in the same city. This is a first in the country not only in the field of robotics, but also in the medical field. The members of the Congolese team in charge of producing these prostheses were trained by Sano Celo,[3] a French start-up promoting 3D printing for health and development in Africa.

A high-risk environment

In 2013 it was estimated that there are 10.5 million people with disabilities in the DRC, or nearly 15% of the population.[4] This high statistic, which includes both physical and intellectual disabilities, is partly due to the fact that the Congolese population lives in a high-risk environment, characterised by armed conflict in parts of the country, regular earthquakes, disease, poorly controlled and dangerous road traffic, and even unregulated construction sites, all of which carry the potential risk of losing limbs. This risk is worsened by the deterioration of the health system throughout the country.

According to the National Road Accident Prevention Commission in the DRC, of the 12,500 accidents that occurred between 2007 and 2009, there were 1,400 deaths and 4,402 injuries.[5] While earthquakes are prevalent for those living in the provinces of North and South Kivu in the east of the country, regular reports also emerge of people being injured when houses or walls collapse on ad hoc construction sites that are largely uncontrolled by authorities.

Even if there is officially no civil war,[6] the country continues to record deaths and injuries linked to the activities of armed groups that are very present in the eastern part of its territory. People living in this part of the country, for example, face the threats of being shot or stepping on anti-personnel landmines. In 2014, the International Committee of the Red Cross working in the DRC said it was caring for 576 people with lower-limb amputations, all a result of the armed conflict.[7]

On 30 September 2015, the DRC acceded to the Convention on the Rights of Persons with Disabilities.[8] The purpose of this convention is to promote, protect and ensure the dignity, equality before the law, human rights and fundamental freedoms of people with disabilities of all kinds. Yet despite the work by groups such as the Red Cross, widespread poverty, coupled with a deterioration of the health system in the country, means that the care of patients poses many problems. People living with disabilities are abandoned to their plight and have enormous difficulties in caring for themselves.

1 https://cd.ambafrance.org/L-Institut-francais-de-Bukavu-Halle-des-Grands-Lacs

2 Harrop, J. (2015, 21 July). Are 3D printers robots? *IDTechEx*. https://www.idtechex.com/en/research-article/are-3d-printers-robots/8118

3 https://www.facebook.com/profile.php?id=100011551902360

4 http://www.adry.up.ac.za/index.php/2013-1-section-b-country-reports/republique-democratique-du-congo-rdc

5 http://business-et-finances.com/les-accidents-de-circulation-en-baisse

6 The DRC has experienced several wars since 1996, so it is difficult today to talk about a post-conflict situation.

7 https://www.icrc.org/fr/document/republique-democratique-du-congo-5-000-personnes-handicapees-prises-en-charge-depuis-1998

8 https://treaties.un.org/doc/Publication/CTC/Ch_IV_15.pdf

There is no national policy to support them, including in finding meaningful work or when it comes to other needs, such as public transport. For example, the construction of buildings in the country does not take into account people with reduced mobility. In these circumstances, equipping amputees with prostheses manufactured by a 3D printer can allow them to perform certain tasks they were unable to do in the past, and help to secure their independence.

From a simple competition to a concrete project

The 3D Prosthesis Project is a revolution in the fitting of people with lower or upper limb amputations with prostheses in the DRC. While 3D printers have been used in the country for some time, this is a first for the medical field. For example, in Kinshasa, the capital of the country, there is the Lisungi FabLab[9] digital manufacturing laboratory, where there is state-of-the-art technology and prototyping equipment to facilitate the implementation of ideas and promote the acquisition of skills and knowledge through practice, using digital technology.[10] However, this laboratory has not done work linked to the medical field.

Where did the idea come from to manufacture the prostheses using a 3D printer? It all began in October 2017 with a robotic "hackathon" organised by the French Institute of Goma, which brought together 85 young Congolese engineers, computer scientists, doctors and designers together with specialists from Sano Celo. By the end of the hackathon, a hand prosthesis had been produced using 3D printing. This prosthesis is now used by a young person in Goma who was the victim of a traffic accident.[11]

The success of the robotic hackathon quickly fuelled new ambitions. In 2018, the French Institute of Bukavu set up the 3D Prothesis Project in collaboration with Ciriri Hospital and Sano Celo. The objective of this project is to provide patients (amputees) with prosthetic limbs at a lower cost.

It is these three partners who have given shape to the project, each with a specific role. The French Institute offers a training framework and laboratory as well as equipment including printers and PLA[12] and PVA[13] from France. Sano Celo provides training on the manufacturing process of producing prostheses using the 3D printer. Ciriri Hospital sends amputee patients in need of prostheses to the laboratory.

The doctor-patient-laboratory process

The surgeons at Ciriri Hospital identify the patients, then send the measurements of the limbs that have been amputated to the laboratory, which in turn designs the prostheses. All the post-operation activities, from manufacturing to fitting, are carried out in the laboratory.

It is important to note that centres for people with disabilities in the DRC have existed since 1960, where traditional prostheses are manufactured for patients who have lost their upper or lower limbs. Among these centres are the Centre for the Physically Disabled, "Shirika la Umoja", in Goma[14] and "Heri Kwetu" in Bukavu.[15] The prostheses manufactured in these centres are relatively expensive compared to the means of the patients, most of whom come from poor families. They are also static, i.e. they do not make it easy for the wearer to move when using them.

Although the prostheses manufactured in the laboratory at the French Institute of Bukavu are not robotic prostheses, their design allows wearers more mobility. "With a hand prosthesis made using the 3D printer, the patient can lift a key ring or a bottle, and even if [he or she] cannot lift heavy objects, [he or she] can make movements," according to Dr. Flory Cubaka,[16] a surgeon at Ciriri Hospital. They are also currently given free of charge to patients.

According to Charles Bulabula,[17] a computer scientist at the laboratory, three types of prostheses are manufactured there, namely hand, leg and finger prostheses. The average time for the manufacture of a prosthesis using the 3D printer is 48 hours. The manufacture of finger prostheses is a first in the DRC. Until now, the various centres for people with disabilities in the country have only manufactured leg and hand prostheses, but not finger prostheses. In other words, the manufacture of finger prostheses is another particularity of this project, because now people whose fingers have been amputated can benefit from artificial fingers, which was not possible in the country before the project started.

Scaling up the 3D Prosthesis Project

Currently the project only treats patients from Ciriri Hospital, but it plans to expand to other hospitals

9 https://www.lisungifablab.org

10 http://www.onerdc.net/?navigation=ar&id=1524

11 https://www.impactmag.info/un-hackathon-robotique-a-goma

12 PLA (polylactic acid) is a plastic that is fully biodegradable under industrial conditions and particularly popular in the fields of food packaging, plastic bags and 3D printing.

13 PVA (polyvinyl alcohol) is a water-soluble synthetic resin used in 3D printing.

14 https://www.umoja.be/umoja/le-centre-handicap%C3%A9s-phys-chp

15 http://www.herikwetu.org/fr/qui-nous-sommes

16 Interviewed for this report on 22 June, 2019 in Bukavu.

17 IT consultant and intern at the 3D Prothesis Project of the French Institute of Bukavu.

in the near future. This is why an application has already been set up to improve project management. The so-called "3D Application" is a platform designed by Charles Bulabula that allows surgeons from different hospitals to send the measurements of the prostheses to the laboratory, follow up with the patients who receive prostheses, and get feedback from the patients.

Users of the application will be hospital surgeons and patients registered on the platform, as well as members of the project team. To access it they will have to have a PC or a mobile phone connected to the internet.

Because of the poor quality of the internet and its low penetration rate in the DRC, Bulabula is currently working on the possibility of providing access to this platform by 2020 even if users are not connected to the internet and do not have smartphones. Users will only need to have a simple mobile phone and be in an area covered by the cellular network to connect to the platform. Because of this, patients and surgeons from village hospitals will have access to the platform and will be able to benefit from the project.

Despite the hopes raised by the 3D Prothesis Project, Blaise Bulonza, who is disabled and a coordinator of the Initiative for a Better Future (INAM),[18] believes that for this project to be sustainable, the Congolese government must be involved in subsidising the manufacture of the prostheses. His remark is nothing more than a simple call to the Congolese state to respect the constitutional spirit according to which people with disabilities are entitled to specific protective measures in relation to their physical and intellectual needs and rights.[19]

Conclusion

The arrival and use of the 3D printer in the field of health in the DRC is a major advance in that it now allows patients with amputated hands, arms or fingers to access the benefits of modern technology, allowing them more mobility. However, it should be pointed out that the impact of this project is still minimal in relation to the needs of amputees. At Ciriri Hospital alone, at least one to two patients each week have a limb amputated.[20] At the same time, the environment conducive to accidents and even diseases that lead to the amputation of patients' limbs is far from being low-risk. Entire villages in eastern DRC still contain anti-personnel mines that continue to claim victims. Quality health care is not yet accessible to the majority of the Congolese population, who, due to a lack of resources, do not go to hospital or go there late, increasing the risk of having a limb amputated.

How the project has been set up also does not assure its longevity. The manufacture of prostheses using the 3D printer is entirely handled by the French Institute of Bukavu, yet each project has a beginning and an end, which means that the day the institute cuts its support, the project could come to a standstill. The training of Congolese surgeons and young computer scientists by the French Institute on the use of the 3D printer in the health field is a good thing for the sustainability of the laboratory, but it is not enough, because the raw materials for printing prostheses come from France via the French Institute.

Although the majority of the Congolese population is poor, there is reason to doubt the project's ability to continue to offer the prostheses to all patients free of charge, especially when the project scales up to include many other hospitals.

Action steps

The following steps are recommended for the 3D Prothesis Project:

- The French Institute of Bukavu should involve the Congolese government in the project through the provincial health division of South Kivu, and request, for example, the exemption of taxes and tariffs on imported products and parts used for the manufacture of prostheses for amputees.
- The laboratory at the French Institute of Bukavu should also collaborate with Congolese universities that have computer departments, so that their students can be trained in the use of the 3D printer, especially in the health field. While this could help with the sustainability of the project, trained students will also be able to continue this project in other forms and exploit other opportunities that the 3D printer offers.
- The institute should offer the 3D Prothesis Project team the possibility of carrying out study trips to France, for example, to see how French start-ups operating in the field of artificial intelligence are oriented towards health work.
- The project team should pay particular attention to feedback from patients who are already equipped with its prostheses to understand their experiences and how they adapt to their new prostheses, in order to improve them if necessary.

18 INAM is a human rights organisation for people with disabilities based in Bukavu.

19 Article 49 of the DRC's constitution.

20 Dr Flory Cubaka, surgeon at Ciriri Hospital, during an interview with us on 22 June 2019 in Bukavu.

GLOBAL INFORMATION SOCIETY WATCH 2019

Artificial intelligence:
Human rights, social justice and development

Artificial intelligence (AI) is now receiving unprecedented global attention as it finds widespread practical application in multiple spheres of activity. But what are the human rights, social justice and development implications of AI when used in areas such as health, education and social services, or in building "smart cities"? How does algorithmic decision making impact on marginalised people and the poor?

This edition of Global Information Society Watch (GISWatch) provides a perspective from the global South on the application of AI to our everyday lives. It includes 40 country reports from countries as diverse as Benin, Argentina, India, Russia and Ukraine, as well as three regional reports. These are framed by eight thematic reports dealing with topics such as data governance, food sovereignty, AI in the workplace, and so-called "killer robots".

While pointing to the positive use of AI to enable rights in ways that were not easily possible before, this edition of GISWatch highlights the real threats that we need to pay attention to if we are going to build an AI-embedded future that enables human dignity.

GLOBAL INFORMATION SOCIETY WATCH
2019 Report
www.GISWatch.org

APC
ARTICLE 19
Sida