Case Study

Aspect

Improving water supplies through mobile data

2021

Venture
Smart Handpumps

Social science discipline
Geography, Environmental Studies and Archaeology

Aspect Members
University of Oxford

Sector
Environment

Route-to-market
Research collaboration

Oxford researchers are improving drinking water supplies for rural communities in Africa through modern mobile phone technology

Many rural communities in the Global South use handpumps to access groundwater for their daily water needs. While the quality of this water can be good, one in four handpumps break and remain unfixed for weeks or months due to local mechanics being unaware that repairs were needed. This leaves people forced to find water from alternative sources, which are often further away or unsafe to drink.

One of the big changes in Africa in recent years has been the expansion of mobile phone networks. More people in Sub-Saharan Africa have access to these networks than to improved water supplies. The Smart Handpump technology, developed by Patrick Thomson of the School of Geography and the Environment, converts existing handpumps into 'Smart' handpumps, by installing a robust low-cost transmitter into their handles. The data from these has allowed the UK/Kenya research team to design a new maintenance model that allows a team of mechanics to act quickly to repair them faster. As well as designing, testing and developing the Smart Handpump technology, the team has spun out FundiFix, a social enterprise, which is currently maintaining water systems that serve over 80,000 people in rural Kenya.

- The Smart Handpump consists of an accelerometer, microprocessor and GSM transmitter installed inside the handle of the pump.
- The accelerometer measures the motion of the handle, the microprocessor calculates the volume of water pumped, and the transmitter sends out regular messages containing data on pump handle movement to be stored in a central database.
- Using this technology FundiFix can very quickly dispatch a mechanic to fix pump, reducing pump downtimes from weeks to days.

The interdisciplinary research project is now part of the wider programme of water research at the School of Geography and the Environment, which has led to the creation and incubation of the aforementioned maintenance partner, Fundifix, alongside a trust fund which combines user, private and public finance. This has achieved significant social impact, leading to a change in national policy in Kenya and the establishment of new business models and finance which benefit over 80,000 people with more reliable drinking water in schools, clinics and communities in Kenya.

Innovation with societal impact defines the Smart Handpumps work. The direct impact is to provide better water services to over 80,000 people in Kenya and support UNICEF in Bangladesh through the REACH Programme. The translation of scientific, institutional and financial research into and operational and policy advances for new and sustainable drinking water services is also contributing to new ways of thinking in the rural water sector to make progress towards meeting the Sustainable Development Goals.

The impact

- During the trial, Smart Handpumps reduced the average downtime of a handpump to less than three days, a huge improvement on the weeks or even months that pumps had previously been out of order.
- Fundifix now have service and maintenance agreements with 75 handpump and 28 piped schemes, serving more than 80,000 people and 74 schools in Kitui and Kwale Counties in Kenya. 98% of handpump repairs are completed within three days.
- A crowdfunding campaign raised over £50,000 from more than 200 donors to extend the use of this technology to other communities in Kenya, and beyond. As a result, more people can benefit from sustainable water supplies.
- Findings have influenced water policy in Kenya at a national level, and the approach will now be tested by UNICEF in schools in Bangladesh.
- Smart Handpumps was one of 13 projects chosen by the seven UK Research Councils to be highlighted as ground-breaking and innovative research at the RCUK's first "Research, Innovate, Grow" showcase event in 2015, and was the overall winner of the inaugural Vice-Chancellor's Innovations Award in 2018

"From when the project started, whenever the pump breaks, the fundis [mechanics] come and fix it. From the last time they fixed it, it hasn't broken for a year."

FundiFix customer in Kwale County.

Key Learnings

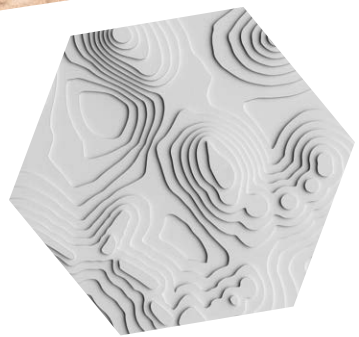
Chris Fellingham,
Licensing & Ventures Manager,
Oxford University Innovations

“Smart handpumps has two key lessons for universities looking at innovative spinouts:”

“Firstly, it is a very powerful demonstration of how interdisciplinary collaboration can create innovative and lasting impact, in this case combining the Geography’s understanding of water issues in rural East Africa, with Engineering brilliance to create a low-cost solution to handpump monitoring.”

“Secondly, the use of crowdfunding was a huge boost to take the product development to the next level, providing needed capital to operationalise the project as well as providing donors and alumni with a novel way to engage with academic research seeking to improve the world we live in.”

What's next for Smart Handpumps?



The team has been developing a new database through the Crowdfunding campaign and subsequent GCRF grant. This can capture more complex information from the pumps using mobile data networks, and share this data with local maintenance partners, NGOs and local government working to improve rural water sustainability. With a more advanced database in place, the team now has an EPSRC Impact Accelerator grant to implement pump condition monitoring on the Smart Handpumps. With this additional functionality, FundiFix will be able identify pumps that are about to break down and dispatch a mechanic to conduct predictive preventative maintenance, opening up the possibility of eliminating pump downtimes altogether.

Background Information

Patrick Thomson

Role

Senior Research Associate

Degree

School of Geography and the Environment, University of Oxford

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Patrick Thomson is Senior Research Associate at the School of Geography and the Environment, and a Social Science Division Innovation Fellow. He is an Environmental Social Scientist researching how information and institutions in the rural water sector moderate people's interaction with their environment. This research is a mixture of social science, natural science and engineering, challenging orthodox ways of thinking while maintaining a practical focus on how to ensure that this research improves health and human development outcomes.

Originally trained as an engineer, Patrick started the department's collaboration with the Institute of Biomedical Engineering, which has built the technical capability of the team through the IBME's expertise in machine learning and data analytics. Prior to returning to Oxford in 2010, Patrick worked in international development, living variously in Sub-Saharan Africa, South East Asia and the Caucasus region. He is a Chartered Engineer and has been granted two patents.

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Aspect

Transforming Society Through Social Science Innovation

Aspect (A Social sciences Platform for Entrepreneurship, Commercialisation and Transformation) is a network for organisations looking to make the most of commercial and business opportunities from social sciences research.

Supported by Research England's Connecting Capability Fund, Aspect members sit at the epicentre of discovery, imagination and progress in the social sciences. We draw together pioneering academics with innovative industry leaders to tackle the most complex societal challenges of our time.

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Aspect is funded by Research England's Connecting Capability Fund