



TU Delft | Global Initiative

Jan Carel Diehl | Steering Board



Global Initiative





Global Initiative

Let's Make Impact

Our mission

Science for the benefit of people. All People. Worldwide

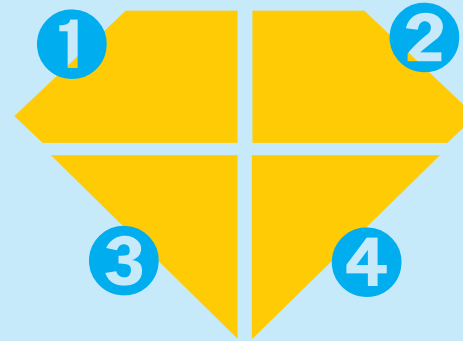
Our goal

Concrete solutions for worldwide problems

**Platform, portal and booster of science and technology
for global development at TU Delft**

TU Delft | Global Initiative mobilizes, supports and positions a growing TU Delft community of researchers and students who contribute to solving low resource countries' challenges with excellent collaborative science, knowledge application, capacity building and education.

The Delft Diamond Approach



- 1. Global Challenge** - start with the challenge
- 2. Science** - use our expertise and creative minds
- 3. Co-Creation** - work together with all relevant stakeholders
- 4. Local Impact** - aim for tangible solutions

How did it start ?

Started as a Bottom – Up by staff

Three professors and a department manager

Inspired by Aalto Global Impact

Moral and challenging drive...

In NL 20 researchers for 1 problem

In Africa 1 researcher for 20 problems

TU Delft already focusing on Profit...Planet.... But lacks People focus

Opportunities TU Delft: new funding, new strategic partners, engaged students, exposure



2015

Support Top – Down by Board

Has to be 5th focus point next to research centers on energy, health, etc.

Has to be university wide

To make impact we have to do it big

Steering board ‘old school’/’new school’

20 PhD Fellowships

Category Experts / Newcomers

Finance (75% board, 25% department)

Local partners – co-create



20 PhD Fellows

Monthly lunch meetings with pitches – cross fertilization

Pressure cookers with seed funding – 15 k - consortium experimenting

Scouting and support for follow up funding – lobbying national fund

Scholarships for African Students - Support TU Delft Students

Staff exchange

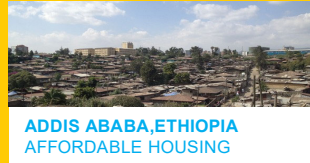
Internal and external communication

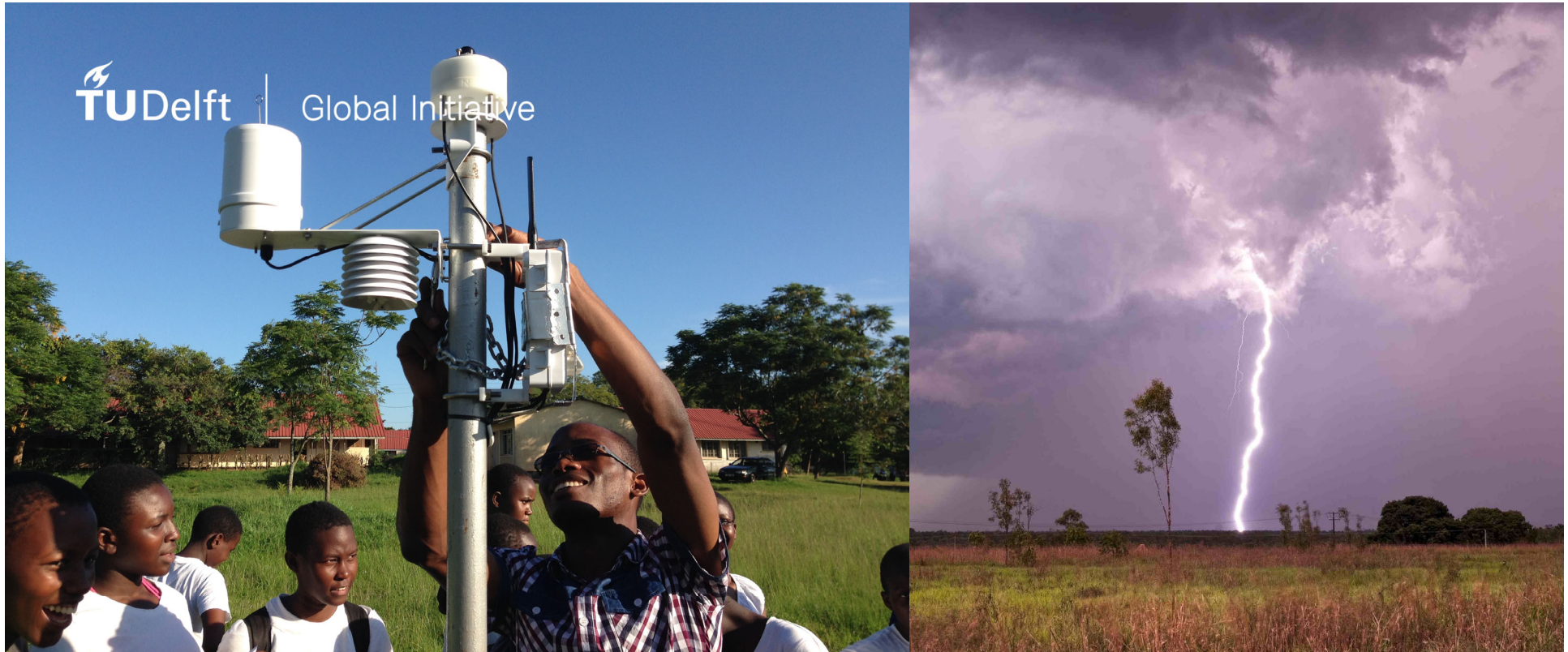
And more..... It became our portal for scientists, students, NGO's, Industry...

Bottom Up Delft Global Community – Real Co-Creation – Fundamental Research but Still Impact



TU Delft | Global Projects





TAHMO: Africa's 20.000 weather stations plan

Reliable data on rainfall in Sub Saharan Africa

TU Delft: N. van de Giesen, M. Kreijns, R. Hut, E. Veenhoven, J. van der Boom, A. Abbasi, F. Annor



TU Delft | Global Initiative

Integrated Turbine Pump for local farmers

Pumping water to higher altitudes using the energy of the river

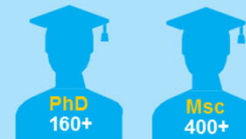
TU Delft: M. Ertsen, J.C. Diehl Partners: aQysta, Practical Action (Nepal),
Securing Water for Food Programme (USAID, U.S.A.), Partners for Water (RVO), Hivos

Facts & figures



active in 21 countries
Sub Saharan Africa
& Southeast Asia

15



students and PhD's from
Sub Saharan Africa and Southeast
Asia enrolled at TU Delft



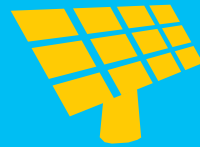
Sub Saharan Excellence
Scholarships per year



Original Global Research Themes



Healthcare



Energy



Urbanisation



Water



Disaster resilience & response



Global Initiative

From themes to programs

Topics which Delft is strong
Where there is a clear need
But also where we have champions

Energy not



Delft Global programs *in development*

Healthcare in low resource settings

- Hospital instrumentation for low-resource settings
- Diagnostics for neglected tropical diseases

Plastic Free Rivers

Characterize, Detect, Separate and Recycle Streams of Plastics

Smart sensors with global impact

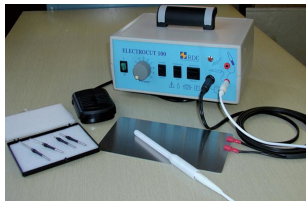
Develop, connect and integrate sensors for environmental sensing

Urbanisation - Liveable cities in the Global South

Integral urban planning and use of local materials for expanding cities

Healthcare for all

Surgery for all



Electrosurgery



Minimally invasive surgery



Training and hygiene

Diagnostics for all



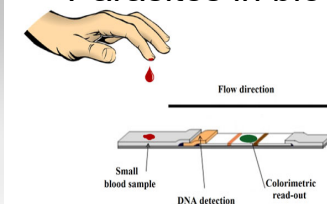
MRI



Parasites in blood

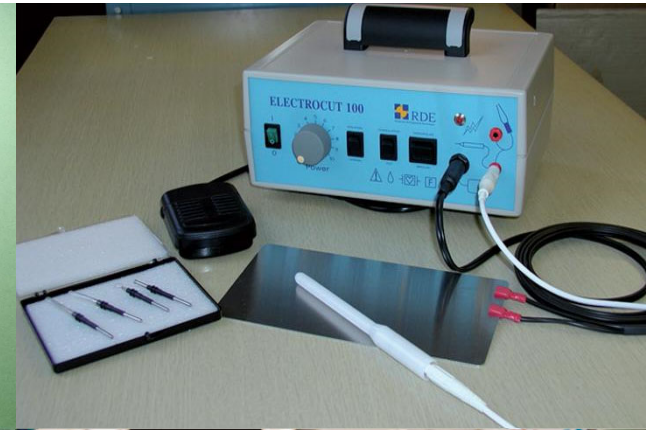
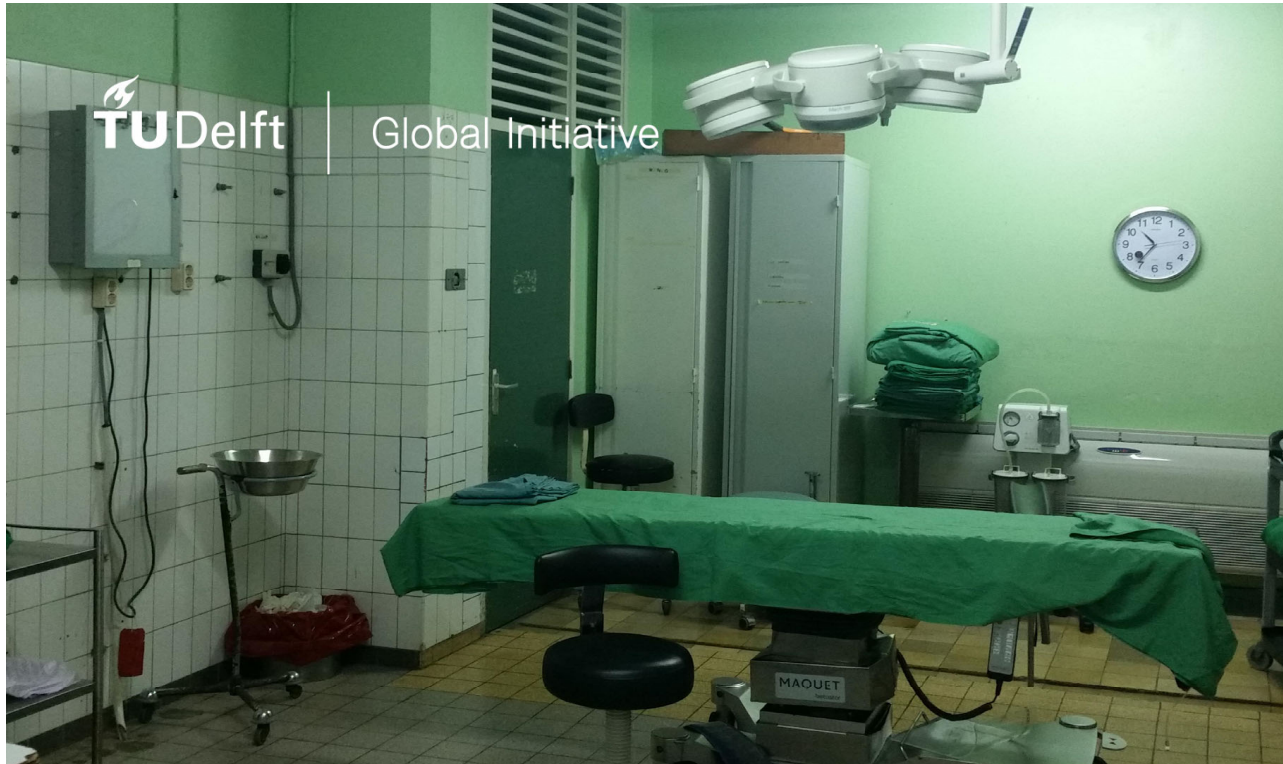


Parasite eggs in urine DNA/RNA from blood



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Safe and high-quality instruments for accessible surgery worldwide

TU Delft: Jenny Dankelman, Frank Willem Jansen, Linda Wauben, LUMC, John Hopkins University, Female Cancer Foundation, Kenya: Technical university of Mombasa and Kenyatta University



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MRI for Africa

Developing an algorithm that makes the detection of hydrocephalus easier

TU Delft: M. van Gijzen, R. Remis, M. de Leeuw den Bouter, D. de Gans, L. Middelplaats
Leiden University Medical Centre, Pennsylvania State University, Mbarara University of Science and Technology

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Optical Smart Malaria Diagnost

Detecting malaria at an early stage using optics, an algorithm and a mobile phone

TU Delft: M. Verhaegen, G. Vdovine, T. Agbana, J.C. Diehl
Leiden University Medical Centre, University of Ibadan (Nigeria), Flexible OKO Tech

Diagnostics for All

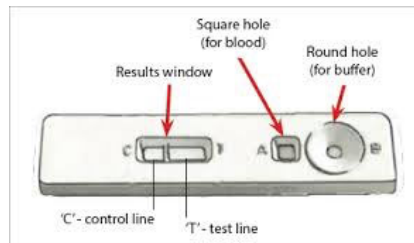
A serious lack of (reliable) health diagnostics in low-resources settings

Results in misdiagnosis (30-90%)

How to provide access to reliable and affordable diagnostics (Diagnostics for All)?

What can be a good alternative for Microscope, RDT, and PCR?

Based on optical systems & smart algorithm





How to replace the golden standard?



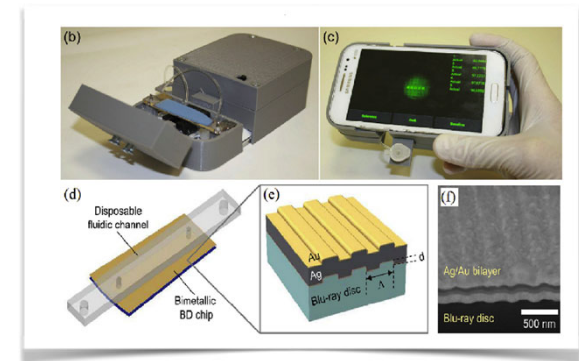
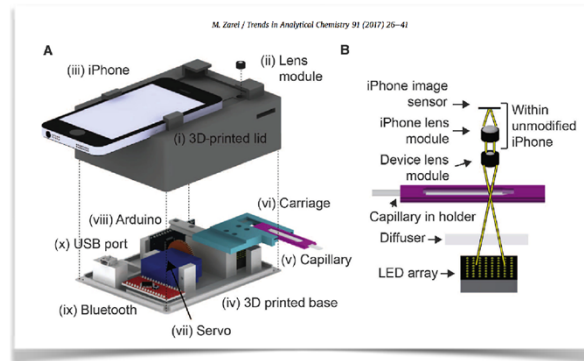
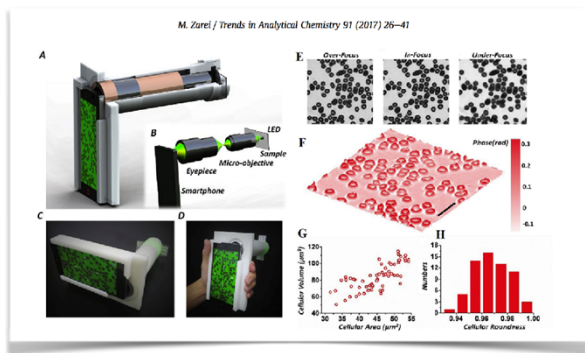
Smartphone based malaria diagnostics device

Captures magnified pictures of blood smear
Automated diagnosis (detection & quantification)

Faculty 3ME & Faculty IDE



Many smart diagnostics devices under development....



But only (very) few end up
in the hand of end-users?



Community effectiveness =

efficacy *

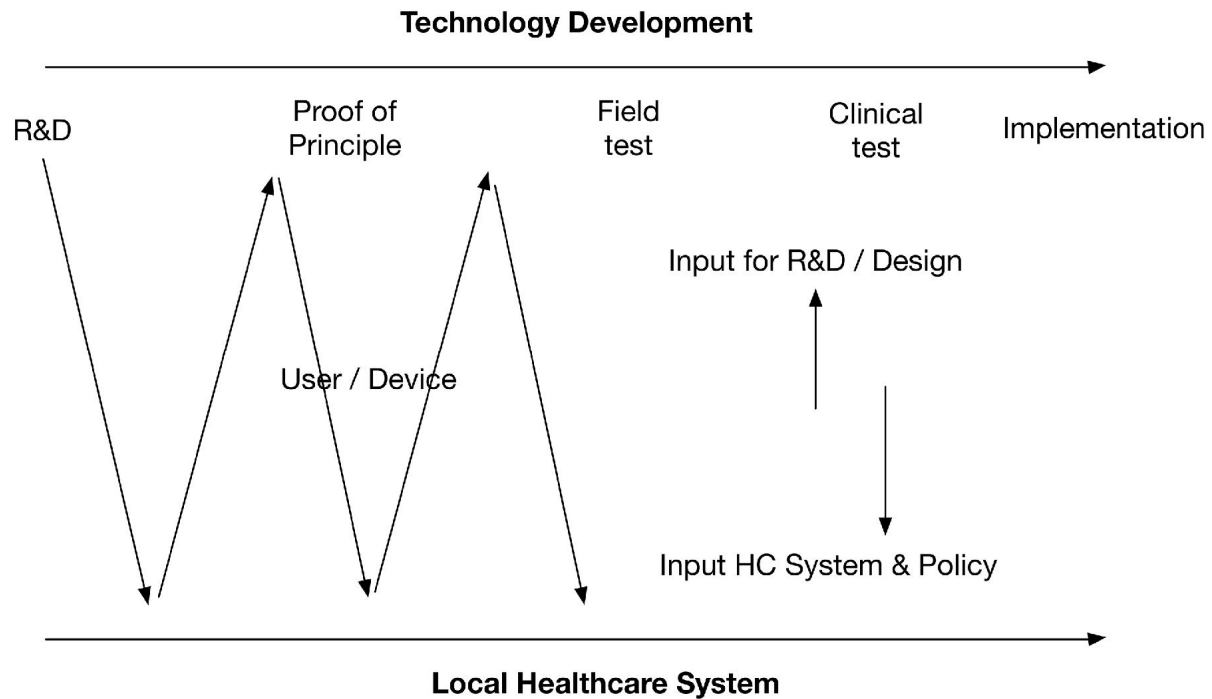
diagnostics accuracy *

medical professional compliance *

patient compliance *

coverage.

Challenge: Bridging gap between technology and user/context



DGI Pressure Cooker & Seed Fund

Health Pressure Cooker

LUMC Parasitology
Nigeria Ibadan Pub. Health

3ME
IDE

15K Seed Fund

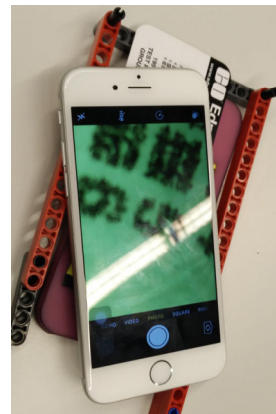


Low cost;

Reversed lens, ball lens, affordable optics

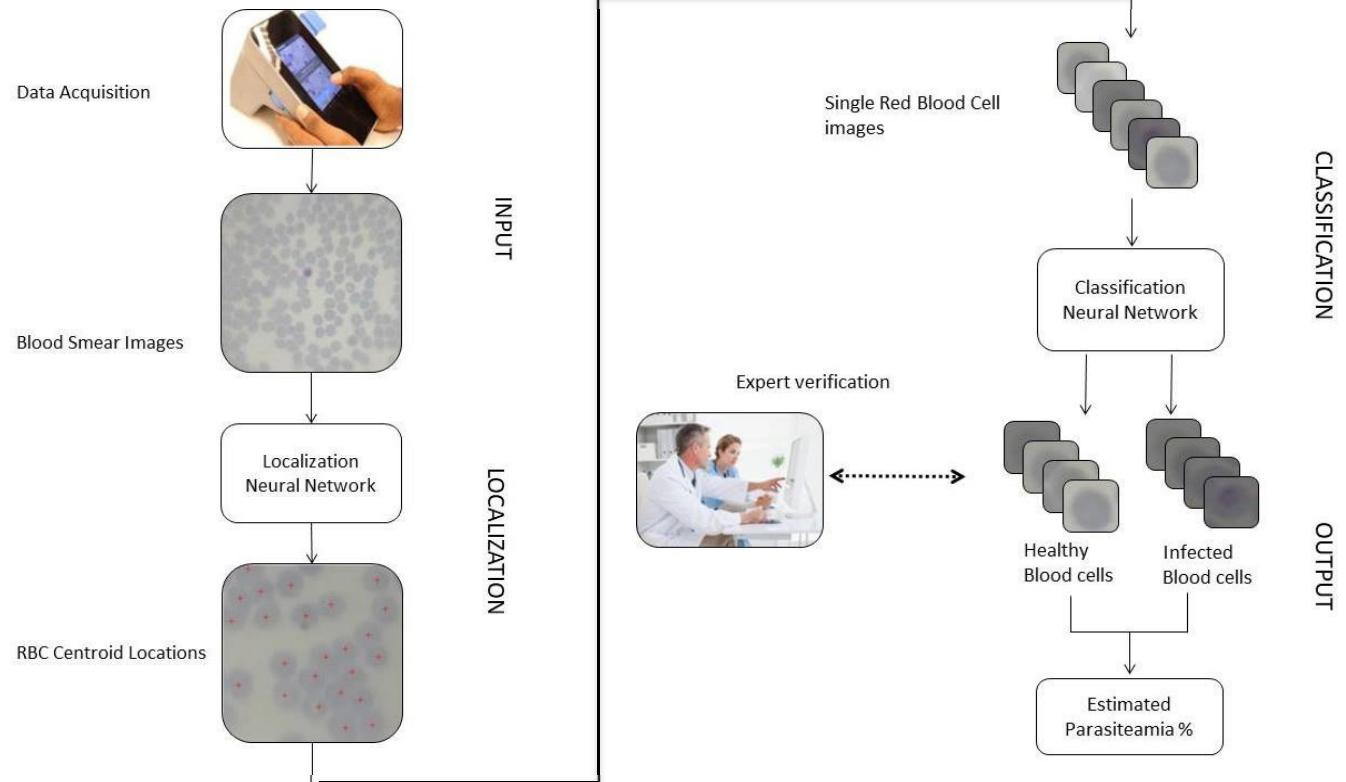
Sensor (camera) phone

Computational unit (phone, Raspberry Pi)



Technology: Smart algorithm

Low computational
Automatic Parasite
Detection
Quantification
Communicate



We can make it smart!
But how smart should it be?



Use and acceptance of a smart mobile malaria diagnostic device: Nigeria



Smartness and feelings



Chapter 11.2 - Patent medicine vendor



Chapter 11.3 - Community pharmacist



Chapter 11.4 - Medical doctor



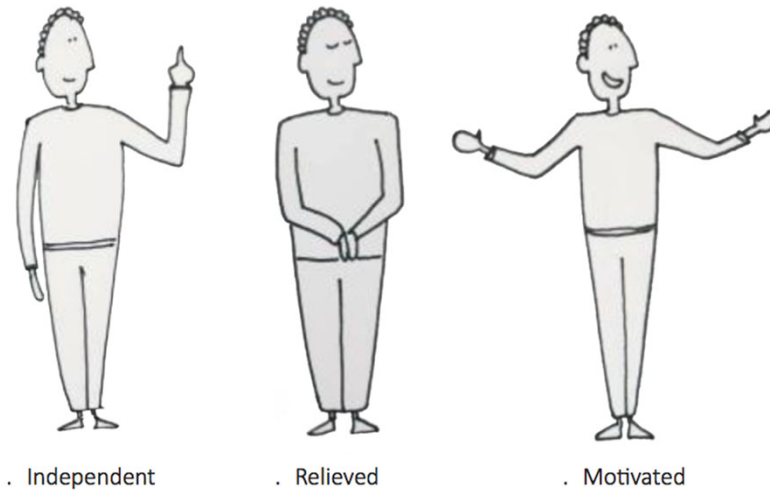
Chapter 11.5 - Medical laboratory scientist



Chapter 11.6 - Nurse



Chapter 11.7 - Medical volunteer



- **FIGURE 10.4**
- Three images of the 'feeling' card sort too. The participants were asked to choose which of the cards did meet their desire when conducting diagnostic tests.



Product specifications

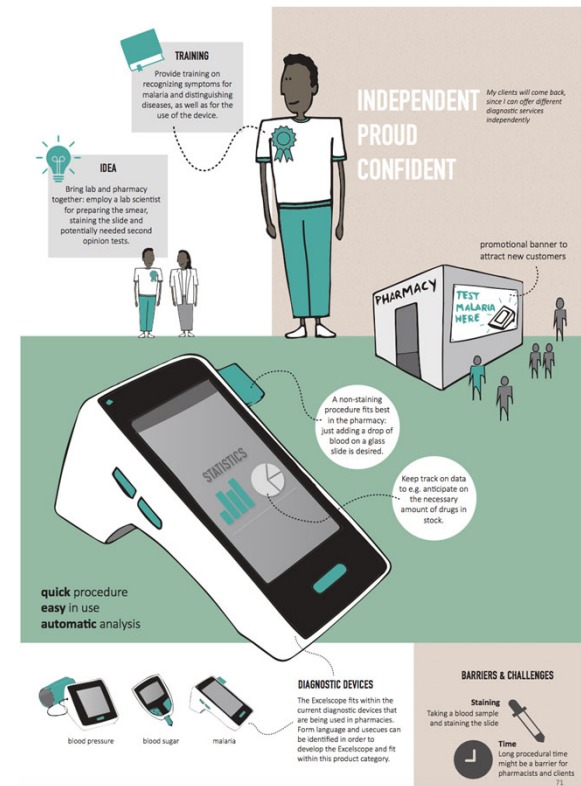
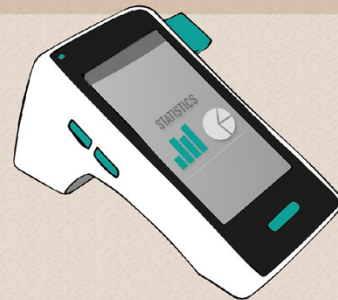


PHARMACIST

**INDEPENDENT
PROUD
CONFIDENT**

"My clients will come back, since I can offer different diagnostic services independently."

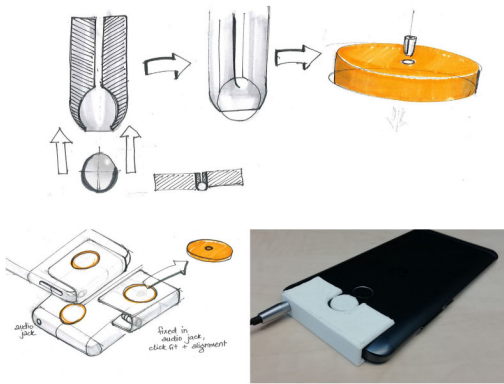
"The patient might feel": he's relying on a third party to get the result, maybe he's not very good..."



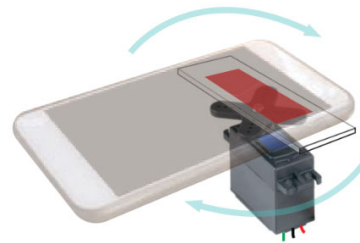
OPTICS



Challenges
 #1 Holding the ball lens
 #2 Mounting it
 #3 Alignment with phone camera

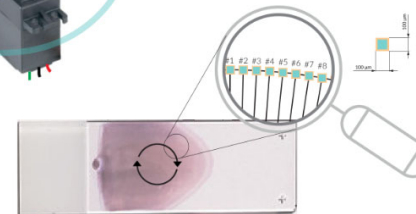


Use only one motor to achieve X and Y axis movement by rotating the blood slide.



- // Reduction in mechanism volume
- // The price of the device is decreased
- // Less components, the system will feature a smaller margin of error.
- // Less power is required making it more efficient.
- // Ease of assembly

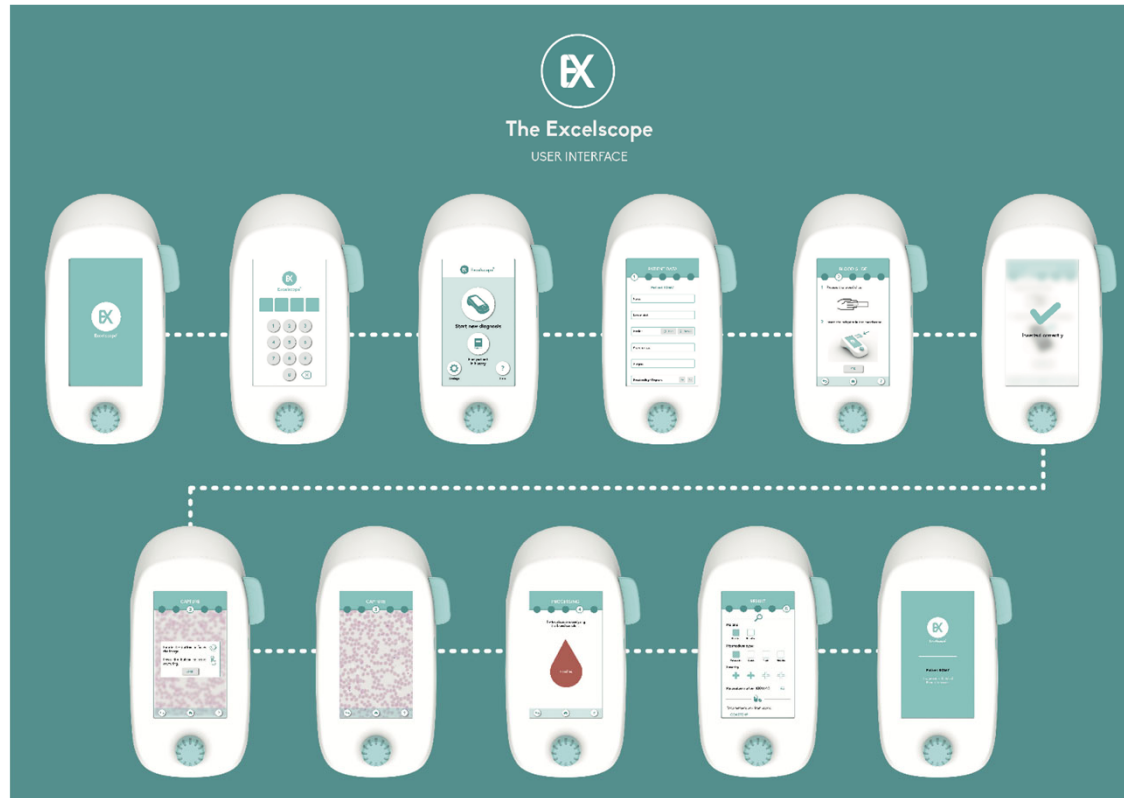
250 field of views along the circumference



Results



Interaction Design







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What next? Impact as university?

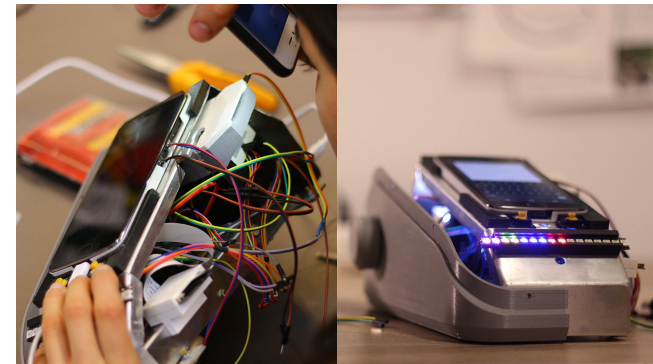
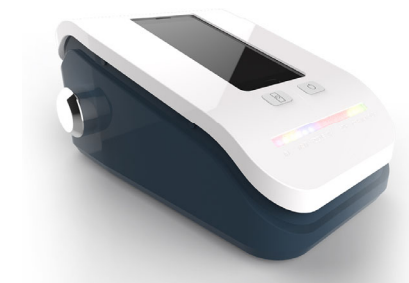


TOP 20 INTERNATIONAAL

EXCELSCOPE 2.0

A semi-automated, smart Malaria diagnostic device using a ball-lens enhanced smartphone, which reduces workload in developing countries while increasing accuracy and decreasing cost of diagnoses.

[→ Vertel een vriend](#)



RESEARCH ARTICLE

Imaging & identification of malaria parasites using cellphone microscope with a ball lens

Temitope E. Agbana¹*, Jan-Carel Diehl²‡, Fiona van Pul³‡, Shahid M. Khan³, Vsevolod Patlan⁴‡, Michel Verhaegen¹‡a, Gleb Vdovin^{1,4}‡a

1 Delft Center for Systems and Controls, Delft University of Technology, Delft, The Netherlands, **2** Design for Sustainability, Industrial Design Engineering, Delft University of Technology, Delft, The Netherlands, **3** Parasitology and Immunology/parasitology Group, Leiden University Medical Center, Leiden, The Netherlands, **4** Flexible Optical BV, Rijswijk, The Netherlands

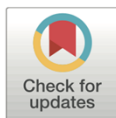
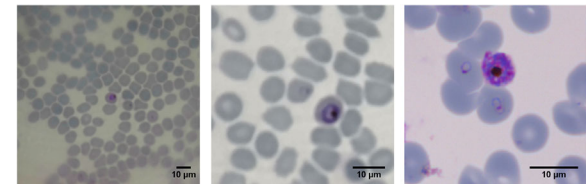
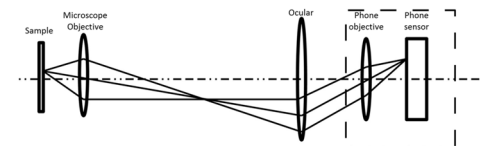
* These authors contributed equally to this work.

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‡b Current address: Precision and Microsystems Engineering, 3ME Faculty, TU Delft, Delft, The Netherlands

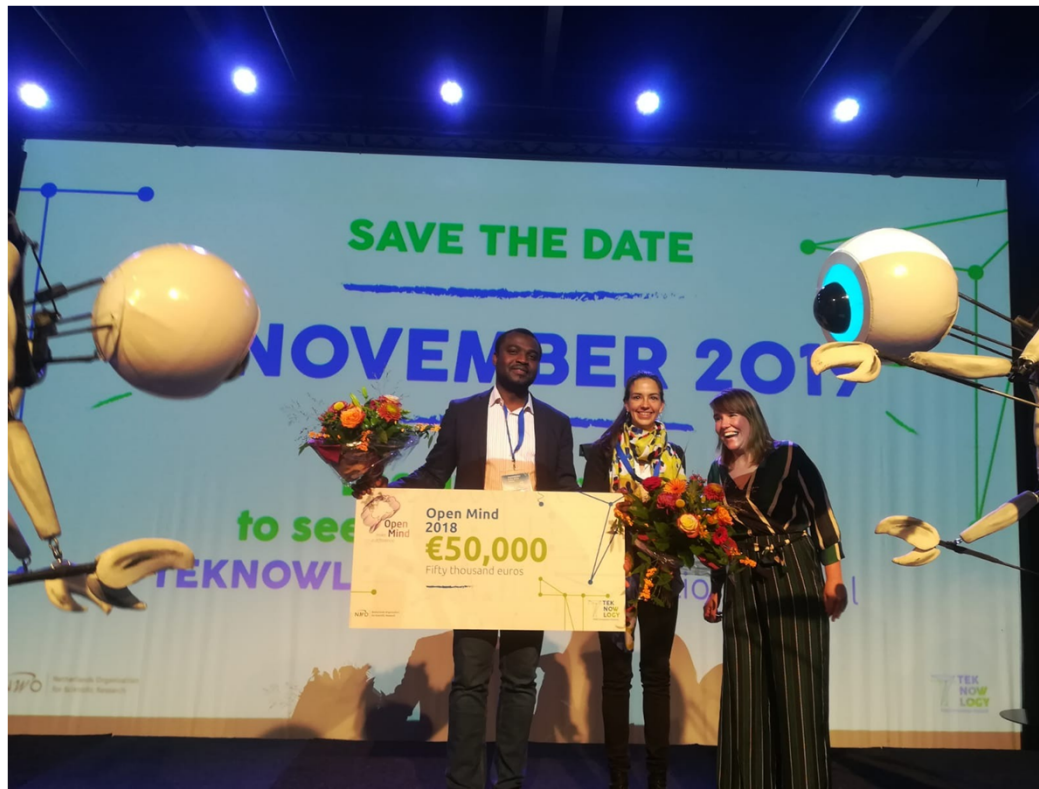
‡ These authors also contributed equally to this work.

* t.e.agbana@tudelft.nl





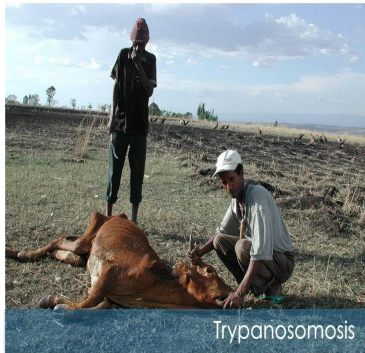
NWO Open Mind Winner - Science



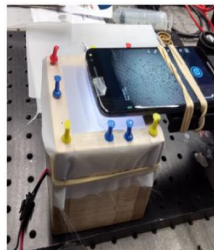
Development of NTD Diagnostics using Smartphone

Who will benefit from our technology

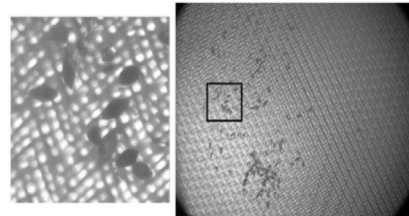
3 Veterinary Medicine



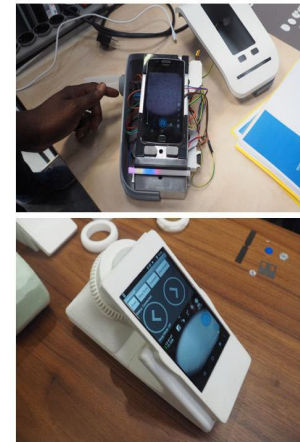
Concept Idea



Detecting Schistosomiasis Eggs



Working prototype





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Jan Carel Diehl | Program manager | j.c.diehl@tudelft.nl

www.tudelft.nl/global