

Empowering African marginalized populations by using networked mobile laboratories over internet

Presented by

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Empowering African marginalized populations by using networked mobile laboratories over internet

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- **Abdloulwahab I. Baoua, membre, Réseau d'information et de communication pour le développement (RICOD), Niamey, Niger**
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9 - 10 - 11 / 12 / 2013

Hotel Ramada Plaza, Gammarth, Tunis

Presentation Outline

- **Marginalized and vulnerable population**
 - **My definition of marginalized populations**
 - **Few examples: Sick in villages or in remote areas; Environmental health challenges related to water contamination; Pupils and students in educational institutions with inadequate infrastructure**
- **Mobile laboratory concept and infrastructure**
 - **Information and Communication Technologies**
 - **Computer Networks; Internet of things, Social Networks, Cloud Computing; Crowdsourcing, miniaturized smart devices & Open software and open hardware trend**
- **Lessons learned; paradigm shift; Strategies, Innovation, success factors**

Lessons learned; Paradigm shift; Strategies, Innovation & Success factors

- Today's **world** is increasingly technically **interconnected**;
- Physical and virtualized networked facilities and devices are being provided ready **access to information society**;
- Crowdsourcing, tagging, commenting, blogging, bookmarking, wikis, videoconferencing tools are **networked participation technologies** enabler for empowering marginalized populations through **self education** and for making their **voices heard**;
- The use of **community mobile laboratories** and **sensor networks** concepts are **evidence based tools** that enable marginalized population to actively **participate** in public discussions concerning their **communities wellbeing**;
- **Internet of things**, virtualization technologies including the **Cloud computing** based systems combined with the proliferation of **open source hardware** initiatives, **crowdsourcing** and **crowdfunding** are the **shifting paradigms** for mobile learning and **self empowerment** of science, engineering and vocational education students thanks to availability of **portable and inexpensive equipment**.

Definition of marginalized population

- **Marginalized population**
 - **Examples: Sick in villages or in remote areas; Environmental health challenges related to water contamination; Pupils and students in educational institutions with inadequate infrastructure**

“A marginalized population is a class of people who have been relegated to the fringe of the society which prevents them from meaningful participation in society.”

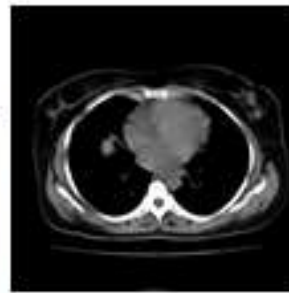
<http://www.ask.com/question/what-is-a-marginalized-population>

« A group of people for which no consideration is given to their welfare and development. They are so vulnerable because they do not participate in research for sustainable solutions for their development in their own environment”

Definition of marginalized population

Example 2: Sick in villages or in remote areas

LA TELEMEDECINE AU NIGER : EXPERIMENTATION DE LA TELERADIOLOGIE



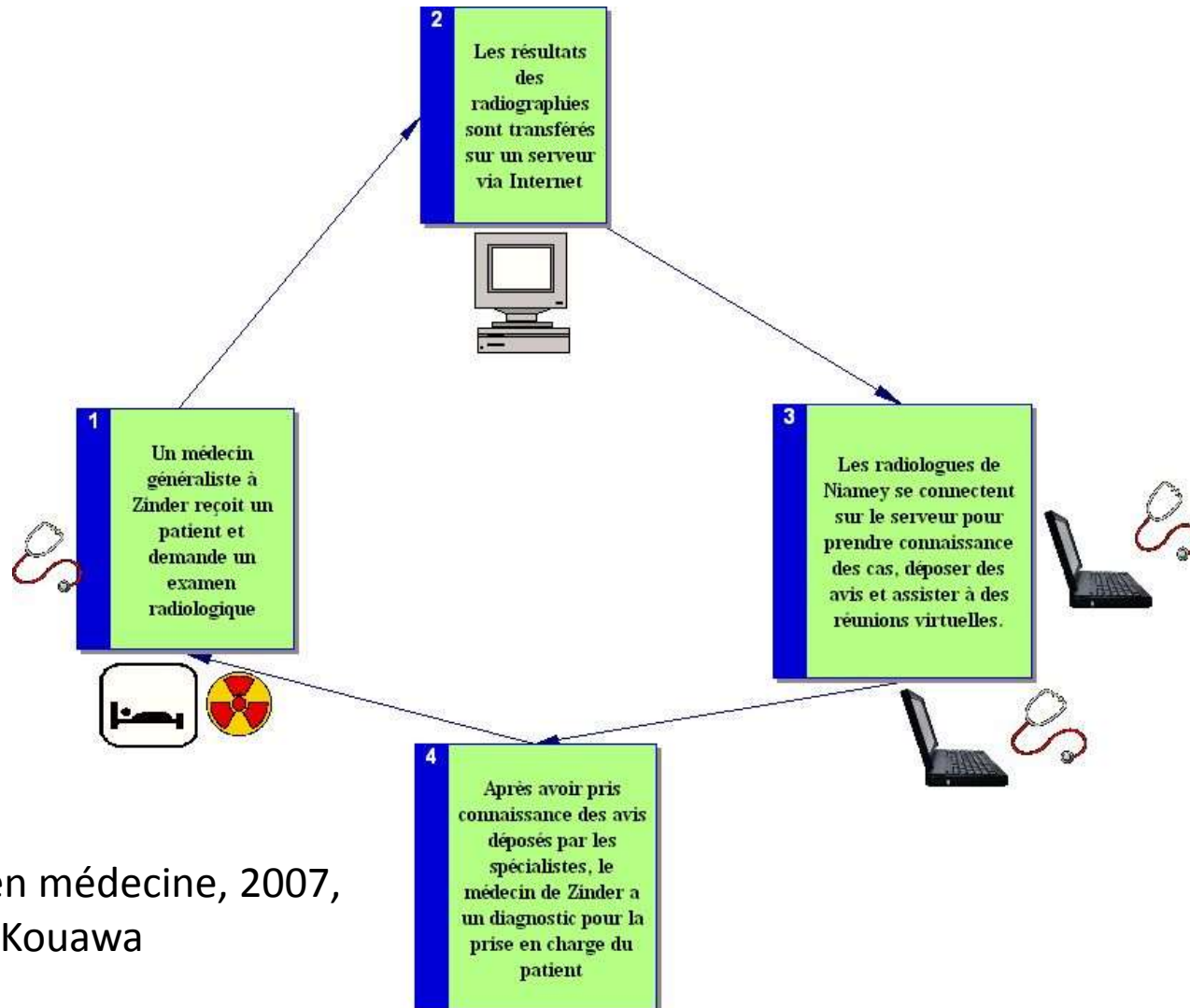
Thèse de Doctorat d'État en médecine, soutenue par
Marianne LAURENT KOUAWO

Sous la direction du Pr. Hamadou SALIAH-HASSANE
et du Dr Herbert DEGBEY

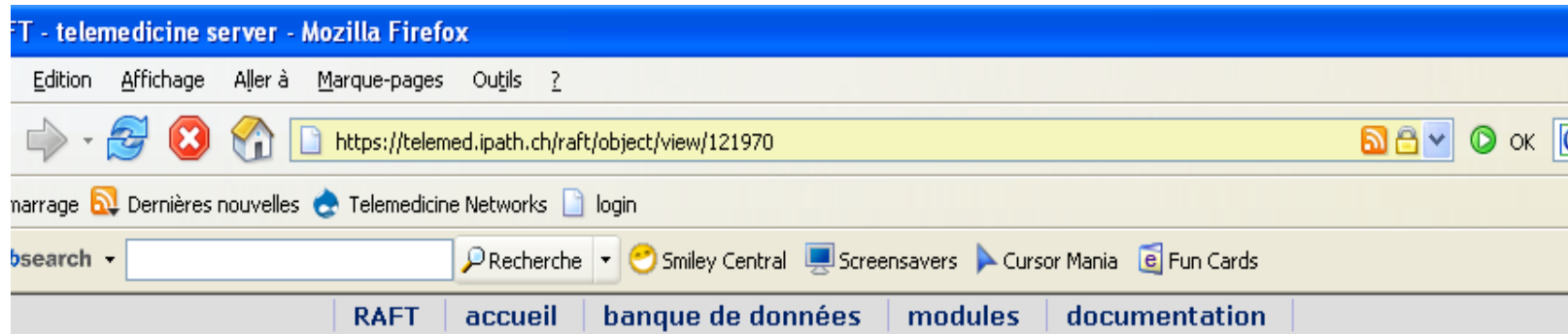
FSS, le 28 avril 2007

Marginalized population

Example 2: Sick in villages or in remote areas



Example 2: Sick in villages or in remote areas: Medical doctors discussions.



Expérimentation/Zinder_Nouveau cas (121970) < | up | >

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Expérimentation/Zinder_Nouveau cas ●	type:	envoyer:	2007-03-27 10:36
sous-titre: tumeur cérébrale?		mariane	RAFT - Forum

Patient _Zinder_002
Patient de 54 ans avec ATCD d'une poussée hypertensive il ya 6 ans, admis dans un tableau d'AVC avec hémiplegie droite, paralysie faciale et une aphonie.
A l'admission patient inconscient, TA à 160/120 mm Hg, une Température à 37° un pouls à 71 battements /min et une Fréquence respiratoire à 22 cycles /min. un premier bilan a été demandé à savoir la NFS qui montre une hyperleucocytose à prédominance granulocytaire, une Azotémie à 0,24 g/l et une glycémie à 0,12g/l. devant ce tableau un scanner a été demandé dont nous vous soumettons les images pour interprétation.

Thèse doctorat en médecine, 2007,
UAM; Marianne Kouawa

Definition of marginalized population

Example 2: Environmental health challenges related to water contamination



Marginalized population

Example 2: Environmental health challenges related to water contamination



Marginalized population

Example 3: Pupils in educational institutions with inadequate infrastructure



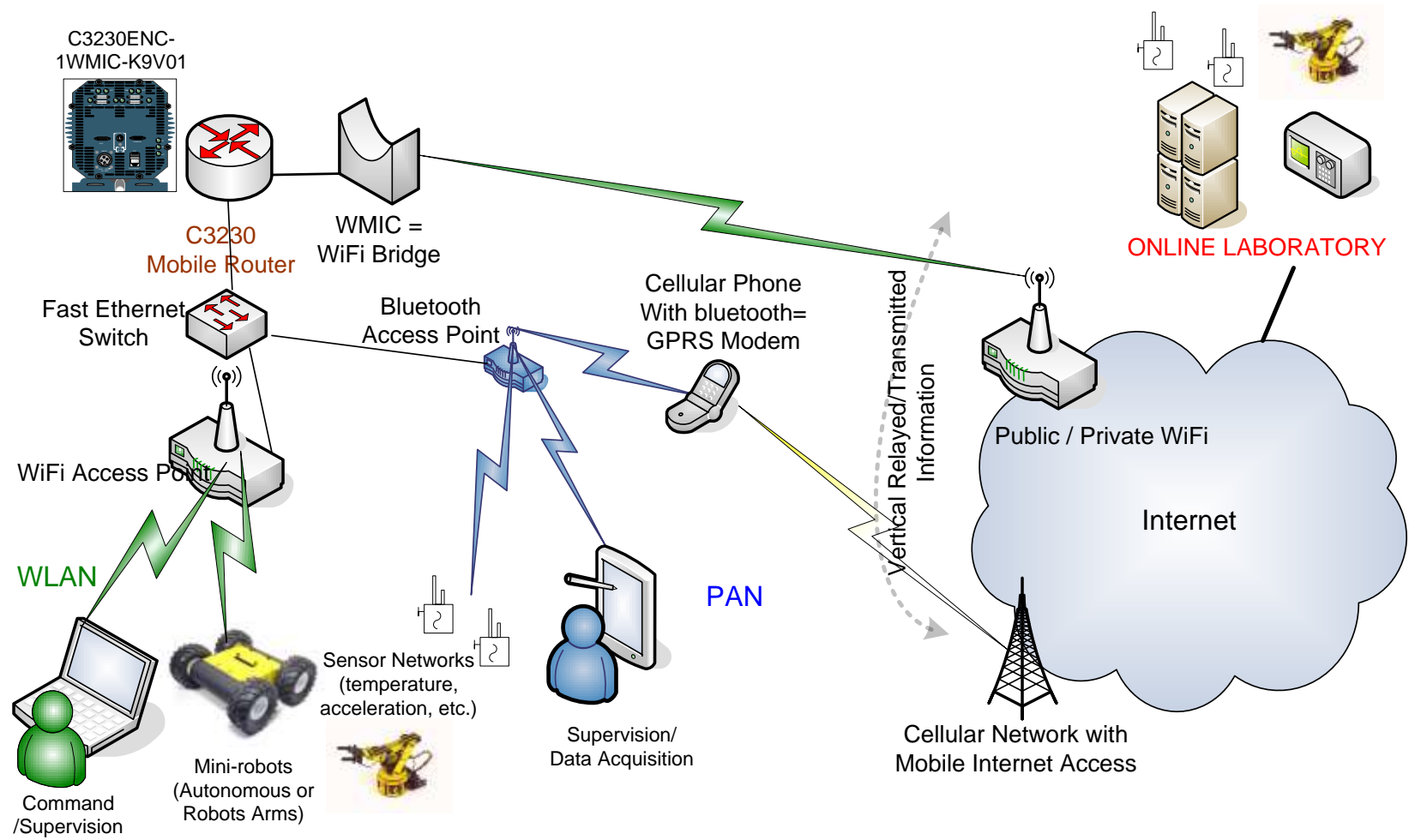
Marginalized population

Example 3: An university Science Laboratory

A First Year Physics Laboratory at Université Abdou Moumouni of Niamey (Niger)
November 2007



Mobile laboratory concept & Infrastructure



Graduate Student Supervision with ICT & Mobile Laboratory: Environmental Studies Thanks to “Vernier” Software and Hardware



Graduate Student Supervision with ICT & Mobile Laboratory: Environmental Studies; Student Feedback

With the equipment that I have been loaned temporarily, I freely collected my data and analyze them without resorting to an outside laboratory or measurement devices also absent in the laboratory of the university.

The comparative cost analysis of services offered by laboratories		
Samples	Lanspex (prix unitaire)	Icrisat (prix unitaire)
pH	8.500	215
Calcium	8.500	540
Phosphore	8.500	290
Magnésium	8.500	540
Ammonium	8.500	865
Nitrate	8.500	865
Chlorure	8.500	540
Conductivité	8.500	360
Salinité	8.500	685
Turbidité	8.500	360
DBO	10.500	10.500
DCO	10.500	10.500
Pour une station	106.000	26.260
Pour les 8 stations	848.000	210.080
Nombre total d'échantillonnage (12)	10.176.000	2.520.960
TOTAL COST	\$23.500	\$6000

Computer Networks & Internet of things

Definition:

“A proposed development of the Internet in which everyday objects have network connectivity, allowing them to send and receive data”

- Data collection with smart phones and sensors, RFID
- Crowdsourcing : **Big Data and Disease**

Prevention: *From Quantified Self to Quantified*

Communities: Meredith A. Barrett, Olivier Humblet, Robert A. Hiatt, and Nancy E. Adler. Big Data.

September 2013, 1(3): 168-175.

doi:10.1089/big.2013.0027.

Computerized miniaturized smart devices & Open software and Open sources hardware trend

What is an Open source hardware: Matériel à code source ouvert

“ ... a proposed Open Source Hardware (OSHW) is a term for tangible artifacts -- machines, devices, or other physical things -- whose design has been released to the public in such a way that anyone can make, modify, distribute, and use those things. This definition is intended to help provide guidelines for the development and evaluation of licenses for Open Source....

<http://www.oshwa.org/definition/>

Open Source Hardware (OSHW) Déclaration de Principes 1.0

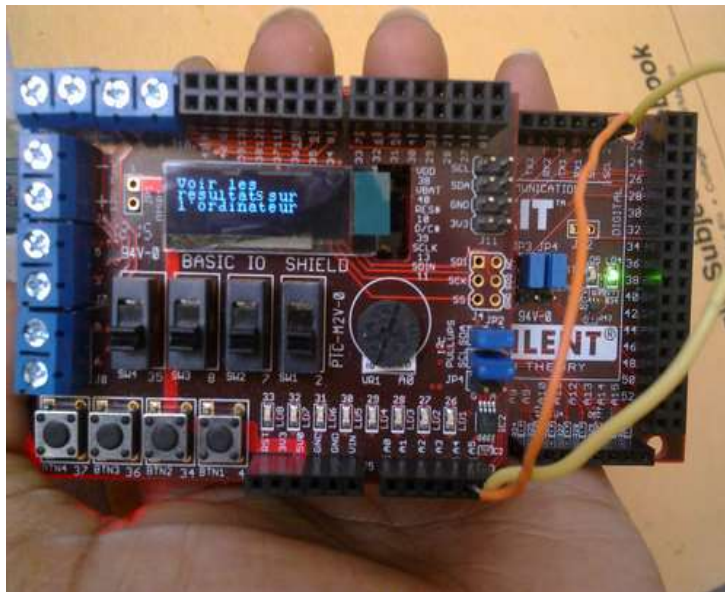
Open source hardware regroupe les conceptions “Hardware” réalisées publiquement et disponibles de manière à ce que n’importe qui puisse étudier, modifier, distribuer, créer et vendre un “design” ou un produit basé sur ce design. La source du produit hardware, le design duquel le produit est issu, est disponible sous un format choisi pour permettre de faire des modifications. Idéalement, open source hardware utilisera des composants et matériaux facilement approvisionnables, des procédés de fabrication standard, des infrastructures libres, des contenus libres de droit et des outils de design “Open-source” pour maximiser la possibilité donnée à d’autres de concevoir ou utiliser un produit hardware. Open source hardware permet à quiconque d’avoir le contrôle sur leur technologie du moment qu’elles partagent leur savoir et encourage le commerce au travers de l’échange de design libre.

Computerized miniaturized smart devices & Open software and Open sources hardware trend

Examples of applications of Open source hardware

Mobile robots remotely controlled for disaster recovery

Weather stations in villages



Computerized miniaturized smart devices & Open software and Open sources hardware trend

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<http://www.oshwa.org/definition/> or <http://freedomdefined.org/OSHW>

<http://www.edn.com/design/systems-design/4313253/Take-advantage-of-open-source-hardware>

Some Open Source Hardware Personal Computers

Raspberry Pi, Ti™ BeagleBoard, PandaBoard, Intel™ MinnowBoard.org



Computerized Miniaturized Modularized Devices & New Business Models

What is crowdfunding:

“ The practice of funding a project or venture by raising many small amounts of money from a large number of people, typically via the Internet”

<http://www.oxforddictionaries.com/definition/english/crowdfunding>

Innovation and power of ideas – Power of number – power of information management



PhoneBloks: <https://phonebloks.com/>

Motorola ARA Project:

<http://www.engadget.com/2013/11/22/motorola-inks-deal-with-3d-systems-to-build-modular-ara-smartphones/>

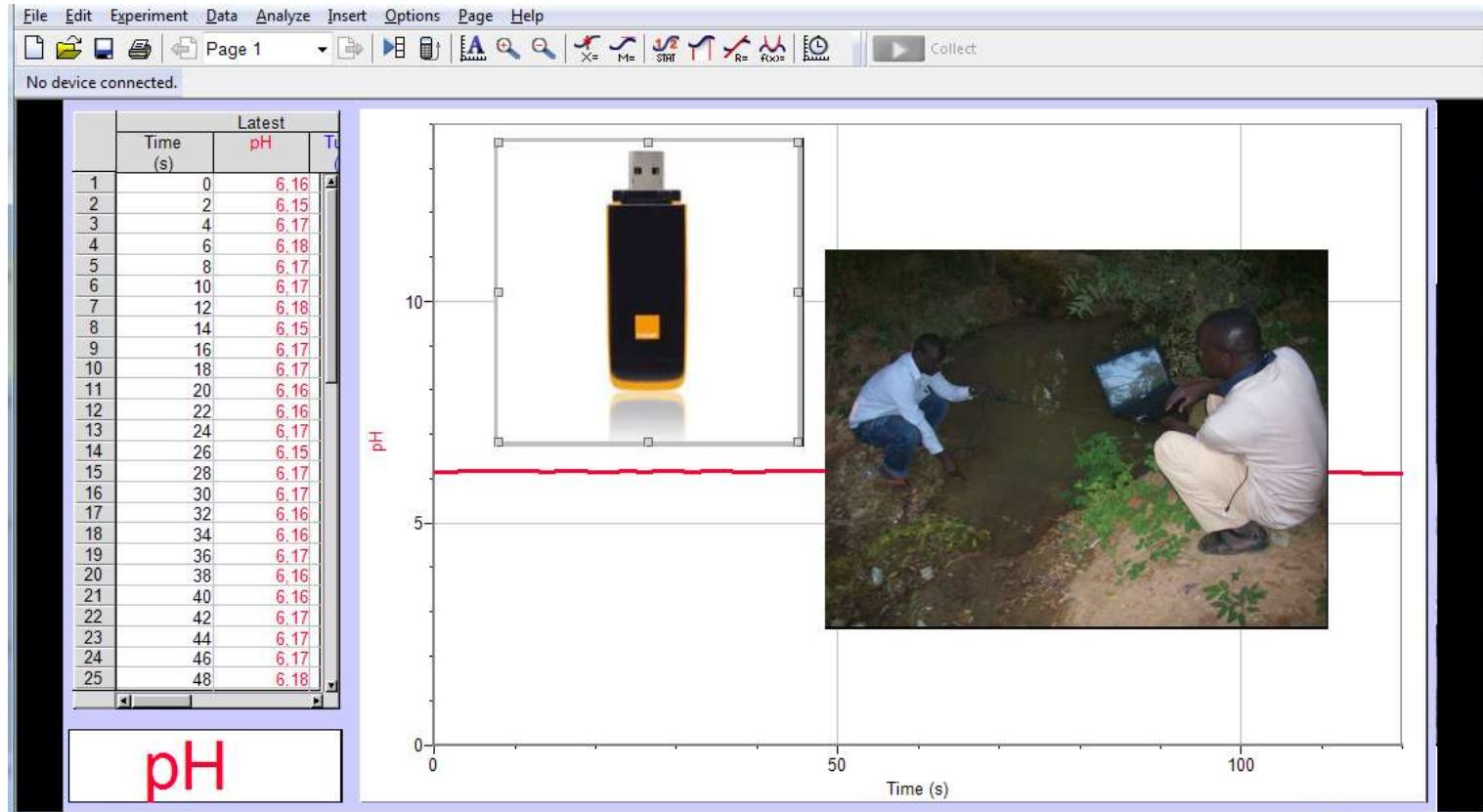
An Instrument Interface on an Android Platform

- The application deployed on an AllView™ Aldro Speed **tablet** (showing the laboratory activity with visible experiment results)
- Standard methods for easy access to mobile laboratories from different platforms



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Crowdsourcing Environmental Data



Lessons learned; Paradigm shift; Strategies, Innovation & Success factors

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