Quiz!

30 minutes (1:45-2:15)

Closed note, closed book

Come up and ask if you have questions.

ICT4D

Information and Communications Technologies for Development

CIS 7000

Andrew Head & **Danaé Metaxa**

Last time

Ability-based design refocuses our attention from what a person cannot do to what they can do, and anchors the design process in their abilities

Accessibility technology aims to provide such augmentations, in domains such as vision, hearing loss, and motor impairment

It can be challenging to balance the opportunities of engineering through accessibility and the recognition of harms carried out through disability

Today

What is ICT4D? What are its goals? What are its problems?

Rethinking technology in the context of local communities

Supporting development efforts

Nationally vs. internationally

Setting the stage

Much of the world's population cannot access smartphones or 5G networks. What design and technical innovations would support these communities?

This area's goals:

- Work with local populations to solve their problems
- When appropriate, identify technological help for local problems or to support local development efforts
- Understand how technology becomes a new version of old problems

"Alongside good governance, technology is considered among the greatest enablers for improved quality of life. However, the majority of its benefits have been concentrated in industrialized nations and therefore limited to a fraction of the world's population."

Could technology aid…

(Micro)credit and capital?

Healthcare?

Education?

Disaster management?

Government?

Eric Brewer
Michael Demmer
Bowei Du
Melissa Ho
Matthew Kam
Sergiu Nedevschi
Joyojeet Pal
Rabin Patra
Sonesh Surana
University of California at Berkeley
Kevin Fall
Intel Research Berkeley

http://tier.cs.berkeley.edu

The Case for Technology in Developing Regions

I hope the industry will broaden its horizon and bring more of its remarkable dynamism and innovation to the developing world.

—Kofi Annan,
United Nations, 2002

Among the broad set of top-down Millennium Development G
that the United Nations established in 2000 (http://www
org/millenniumgoals), one stands out: "Make available the
efits of new technologies—especially information and com
nications technologies."

Alongside good governance, technology is considered among the gre
enablers for improved quality of life. However, the majority of its ben
have been concentrated in industrialized nations and therefore limited
fraction of the world's population. We believe that technology has a large
to play in developing regions, that "First World" technology to date
been a poor fit in these areas, and that there is thus a need for techno
research for developing regions.

Despite the relative infancy of technology studies in developing reg
anecdotal evidence suggests that access to technology has a beneficial
nomic impact. Cellular telephony is probably the most visible applica
but there are many others, some of which we cover in this article.

The World Bank's infoDev site catalogs hundreds of information and c
munications technologies (ICT) projects (http://www.infodev.org), albei

"The goal of ICT4D is to apply the power of recent technologies […] to alleviate the problems of global poverty."

"Technology—no matter how well designed—is only a magnifier of human intent and capacity. It is not a substitute. […] The problem is that ICT4D assumes the very results it seeks to achieve. The human intent and competence ICT4D aims to generate must already be in place for the technology to work. But if developing economies had the capacity, there would be no need for an external technology push: capable people attract, or develop, their own technology.

NOVEMBER/DECEMBER 2010

Can Technology End Poverty?

Kentaro Toyama

This is the lead article of a forum on the role of information and communication technolog development.

A ten-year-old boy named Dhyaneshwar looked up for approval after carefu the word "Alaska" into a PC.

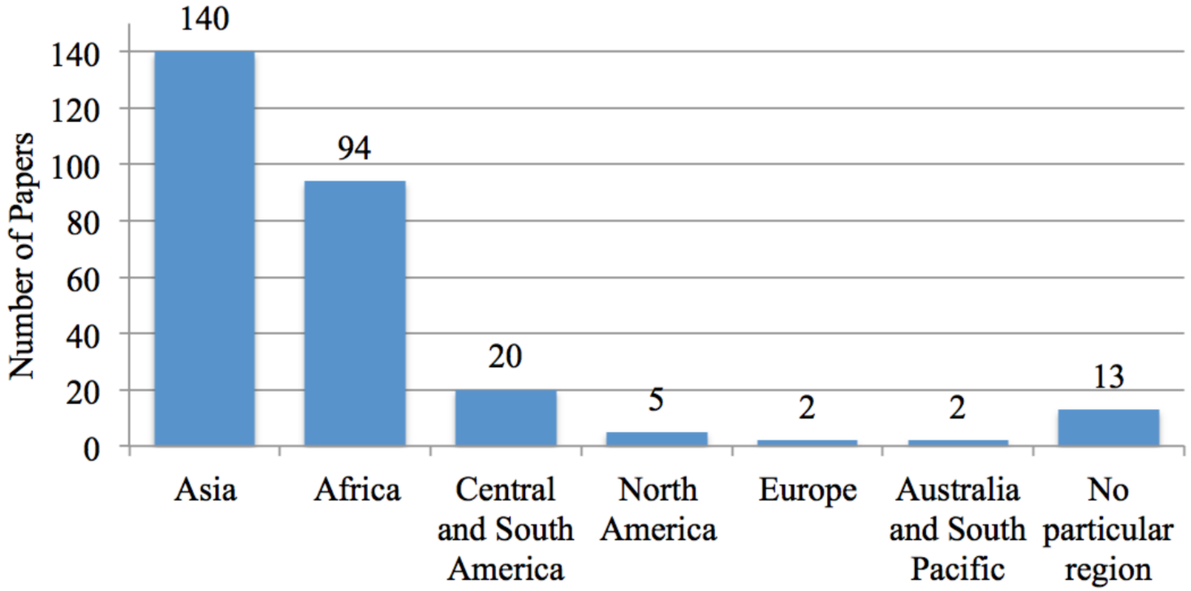
"Bahut acchaa!" I cheered—"very good."

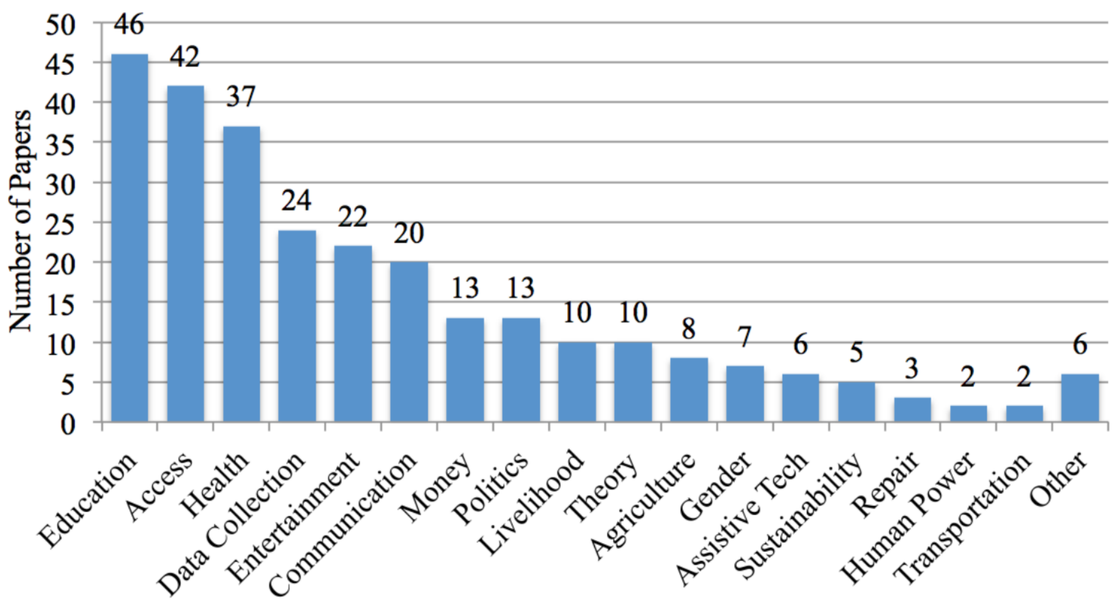
It was April, 2004, and I was visiting a "telecenter" in the tiny village of Ret hours from Mumbai. The small, dirt-floored room, lit only by an open alum doorway, was bare except for a desk, a chair, a PC, an inverter, and a large t battery, which powered the PC when grid electricity was unavailable. Outsi humped cow chewed on dry stalks, and a goat bleated feebly.

As I encouraged the boy, I wondered about the tradeoff his parents had ma to pay for a typing tutor. Their son was learning to write words he'd never u language he didn't speak. According to the telecenter's owner, Dhyaneshwa paid a hundred rupees—about $2.20—a month for a couple hours of lesson That may not sound like much, but in Retawadi, it's twice as much as full-ti in a private school.

Where does ICT4D focus?

[Dell and Kumar 2016]





Generally a focus on the Global South, and on questions of education, access, and health

Rethinking technology in the context of local communities

Novice and low-literacy users

[Medhi et al. 2011]

YOU READ THIS

Today we work and live in a norm of graphical user interfaces

However, much of the world rarely sees such interfaces, or is **low-literacy**. How do we need to change our designs for such people?

- Textual interfaces are unusable at worst and error-prone at best
- Live human operators are much more effective, but image-based or speech-based interaction can also succeed

புதிய மற்றும் குறைந்த கல்வியறிவு பயனர்கள்

[Same thing in Tamil via Google Translate — note how it feels disorienting to English-speakers]

இன்று நாம் வேலை செய்கிறோம் மற்றும் வரைகலை பயனர் இடைமுகங்களின் விதிமுறைகளில் வாழ்கிறோம்

இருப்பினும், உலகின் பெரும்பகுதி இத்தகைய இடைமுகங்களை அரிதாகவே பார்க்கிறது, அல்லது குறைந்த கல்வியறிவு கொண்டது. அத்தகையவர்களுக்கு எங்கள் வடிவமைப்புகளை எவ்வாறு மாற்ற வேண்டும்?

> உரை இடைமுகங்கள் மோசமான நிலையில் பயன்படுத்த முடியாதவை மற்றும் சிறந்த பிழை ஏற்படக்கூடியவை
>
> நேரடி மனித ஆபரேட்டர்கள் மிகவும் பயனுள்ளதாக இருக்கும், ஆனால் படத்தை அடிப்படையாகக் கொண்ட அல்லது பேச்சு அடிப்படையிலான தொடர்புகளும் வெற்றிபெறக்கூடும்

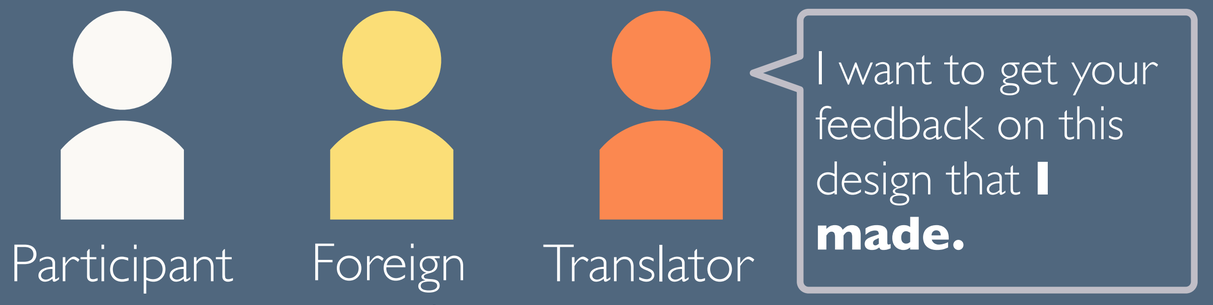
Recall: Demand characteristics

[Dell et al. 2012]

YOU READ THIS

Response **bias** due to signals in a study that indicate what the researcher is hoping to see: **activating status differences**

2.5x more preferred amongst low-status participants



5x more preferred amongst low-status participants

Mobile Q&A for farmers

[Patel et al. 2010]

StackOverflow for farmers: Forum for asking questions and browsing others' questions and responses about farming

All voice-based!

For every user, this was their first online community

Voice-based discussion

[Mudliar, Donner, and Thies 2012; Marathe et al. 2015]

CGNet Swara: a more general **voice-based discussion forum**: record messages of interest, and listen to messages that others have recorded. 757k phone calls logged in five years.

Dominant usage was **resolution of grievances**: overdue wages, resumption of school meals, denied ration cards, police bribes

Participants reported feeling like they were given voice:

> "CGNet helps us women put our voice across. It takes up issues that no newspaper or radio takes up."

Village base station

[Heimerl et al. 2010]

"How successful would **bottom-up cellular networks** be?"

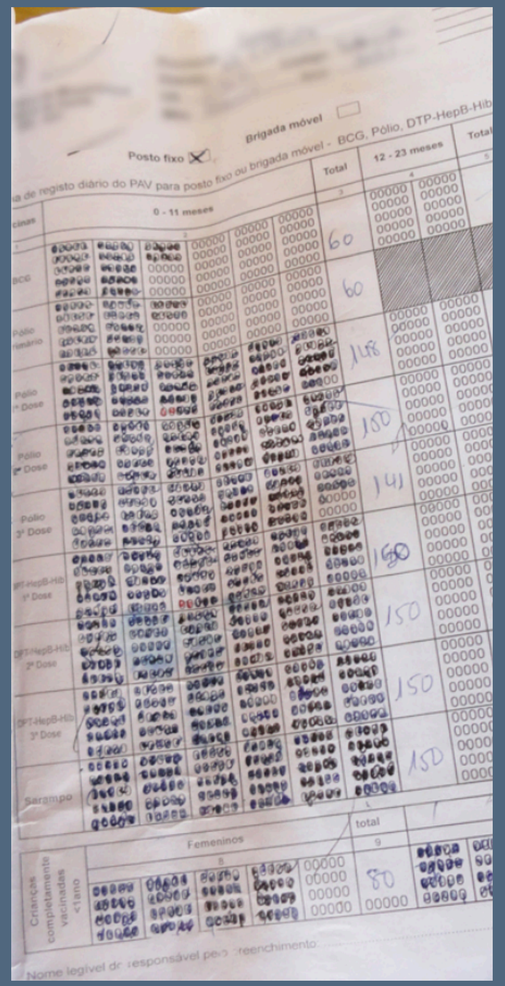
Local cellular network, utilizing existing infrastructure (e.g., power, network, and people) to operate at much lower cost

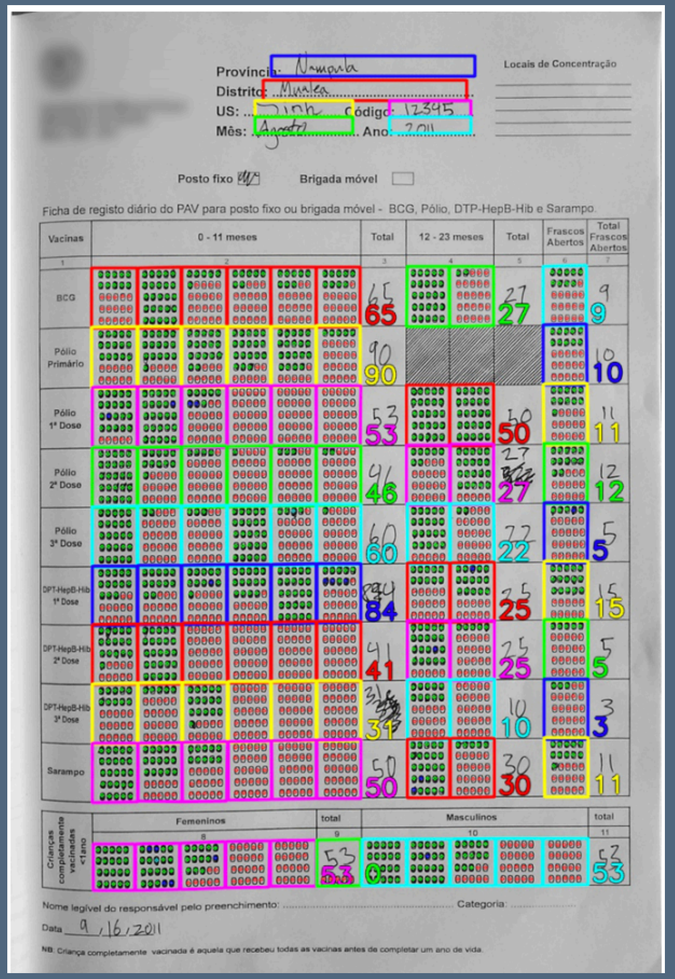
Digitizing paper forms

[Dell et al. 2012]

Most records in low-resource settings are still captured and retained on paper; however, it can be difficult to aggregate and analyze paper data

mScan: a CV-augmented system to help digitize multiple-choice forms





Supporting development efforts

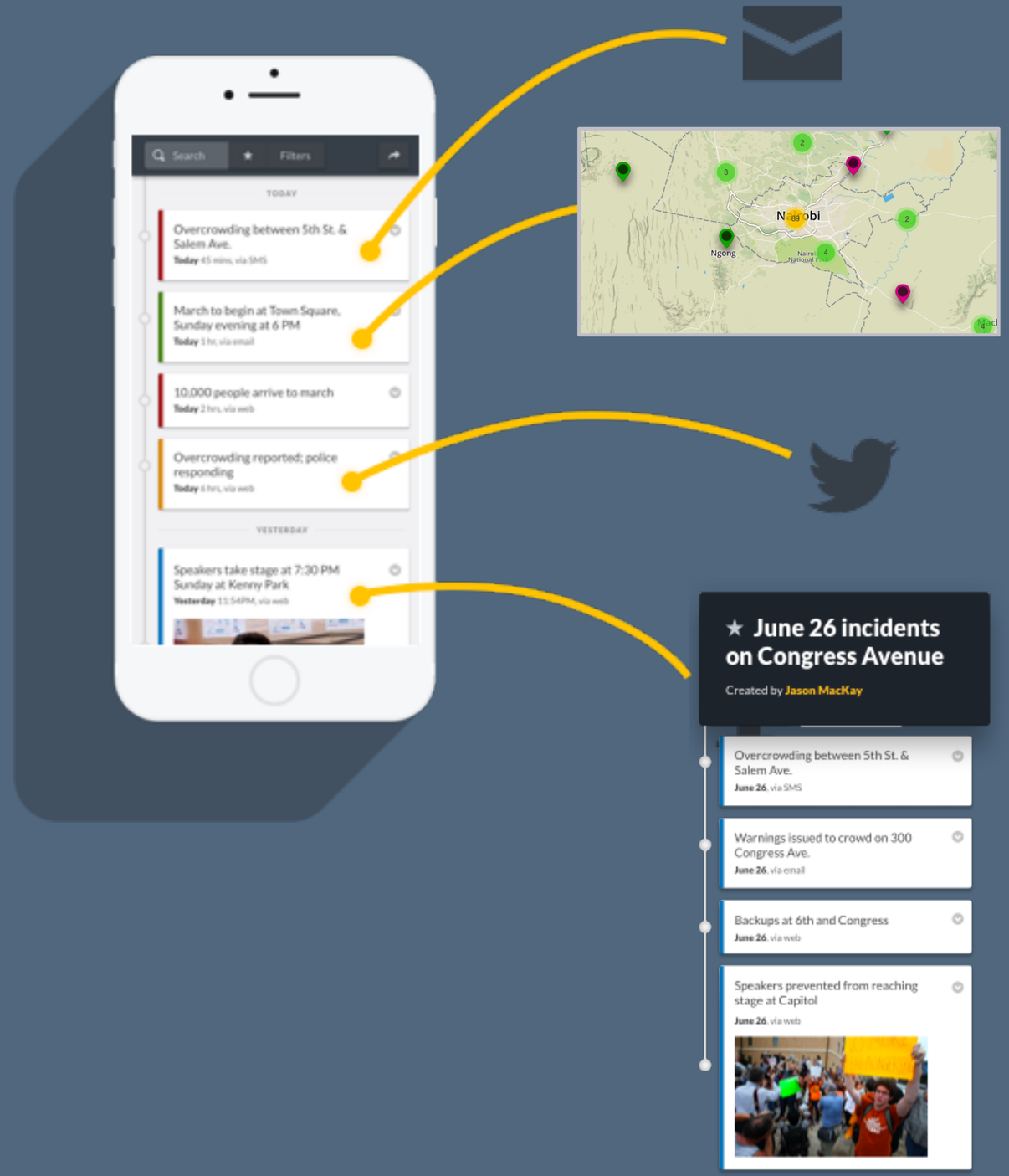
Rather than creating something entirely new, hook into existing efforts

Ushahidi

[Okolloh 2009]

A crowdsourcing platform originally developed to do **crisis mapping**, specifically of post-election violence in Kenya in 2008

Platform allows people to **send reports via SMS**, email, social media



99DOTS

[Cross et al. ICTD '19]

How might we help ensure that patients **adhere to prescribed medication**, at low cost?

99DOTS: drugs are sealed in a wrapper so that when you open them, it gives you a **previously unseen phone number** to call for free. The system logs calls for the doctor.

Five years of deployment: now standard of care for tuberculosis in India, over 200k patients

Work vs. entertainment

[Smyth et al. 2010]

Attention has generally focused on the **telecenter**: a connected cluster of computers to be used for information and work purposes. However, these telecenters are sparsely used.

In contrast, the researchers found a robust ecosystem of usage on low-cost mobile phones for entertainment purposes (songs, videos)

The critique: people are motivated to solve this connectivity problem for the **need of access to entertainment**, whereas **researchers' desired needs for the groups**—healthcare, education, work, etc.—are not as urgently felt.

Social media in revolution

[Wulf et al. 2013]

Debate: **what role does social media play** in revolutions as in the Arab Spring? Was it an important enabler, or simply present?

This paper followed the Tunisian revolution in Sidi Bouzid and found four interlocking factors:

- Wikileaks release challenging the regime's legitimacy
- Web tech connecting activists with news journalists
- Social media connecting local activists with other Tunisian activists
- Social media supported organizational efforts for the activists

Techno-utopianism is not it

The same problems that arise IRL also arise with technology

Social media in revolution

[Wulf et al., CSCW 2013]

Debate: what role does social media play in revolutions as in the Arab Spring? Was it a deterministic enabler, or simply present?

This paper followed the Tunisian revolution; four interlocking factors:

- Wikileaks release challenging the regime's legitimacy
- Web tech connecting activists with news journalists
- Social media connecting local activists with other Tunisian activists
- Social media supported organizational efforts for the activists

"We question a too deterministic view of the role of the new media and the representativeness of investigative techniques that uniquely use the new media in order to assess their impact."

Postcolonial computing

[Irani et al. 2010]

Case study 1: an NGO commissions a design firm to run a field study of a prototype household water filter. But when the design firm gets there, few families are actually having trouble with water-born illness

Case study 2: the lightbulb originally traveled from Europe to Africa. Its components were hidden to "user-proof" it, but as a result, it could not be adapted to connect over distances where the power source was far away from the dark area

Postcolonial computing

[Irani et al. 2010]

What is going on here? Our **assumptions about what design "ought" to look like is flowing from Silicon Valley outward**, where it grates against other cultural frameworks

Consider this in relation to feminist HCI: postcolonial computing is about considering our assumptions in ICT4D.

- What are we assuming as a default cultural frame?
- Are we colonizing the Global South and other areas with our conceptions of design?

Privacy with shared devices

[Ahmed et al. 2017]

In the Global South, device sharing is a norm that is embedded in a cultural practice of sharing. **How do people negotiate privacy?**

Study: qualitative research with 72 participants in Bangladesh

- Examples: shared device between spouses or between siblings
- Negotiated territory: gender/sibling dynamics, transparency vs. monitoring. So, people avoid usage (e.g., "trashy" photos, FB browsing) that could be misinterpreted
- People delete data, negotiate boundaries with each other, download apps that can lock other apps behind a password

Returning to…

NOVEMBER/DECEMBER 2010

Can Technology End Poverty?

Kentaro Toyama

This is the lead article of a forum on the role of information and communication technolog development.

A ten-year-old boy named Dhyaneshwar looked up for approval after carefu the word “Alaska” into a PC.

“Bahut acchaa!” I cheered—“very good.”

It was April, 2004, and I was visiting a “telecenter” in the tiny village of Ret hours from Mumbai. The small, dirt-floored room, lit only by an open alum doorway, was bare except for a desk, a chair, a PC, an inverter, and a large t battery, which powered the PC when grid electricity was unavailable. Outsi humped cow chewed on dry stalks, and a goat bleated feebly.

As I encouraged the boy, I wondered about the tradeoff his parents had ma to pay for a typing tutor. Their son was learning to write words he’d never u language he didn’t speak. According to the telecenter’s owner, Dhyaneshwa paid a hundred rupees—about $2.20—a month for a couple hours of lesson That may not sound like much, but in Retawadi, it’s twice as much as full-ti in a private school.

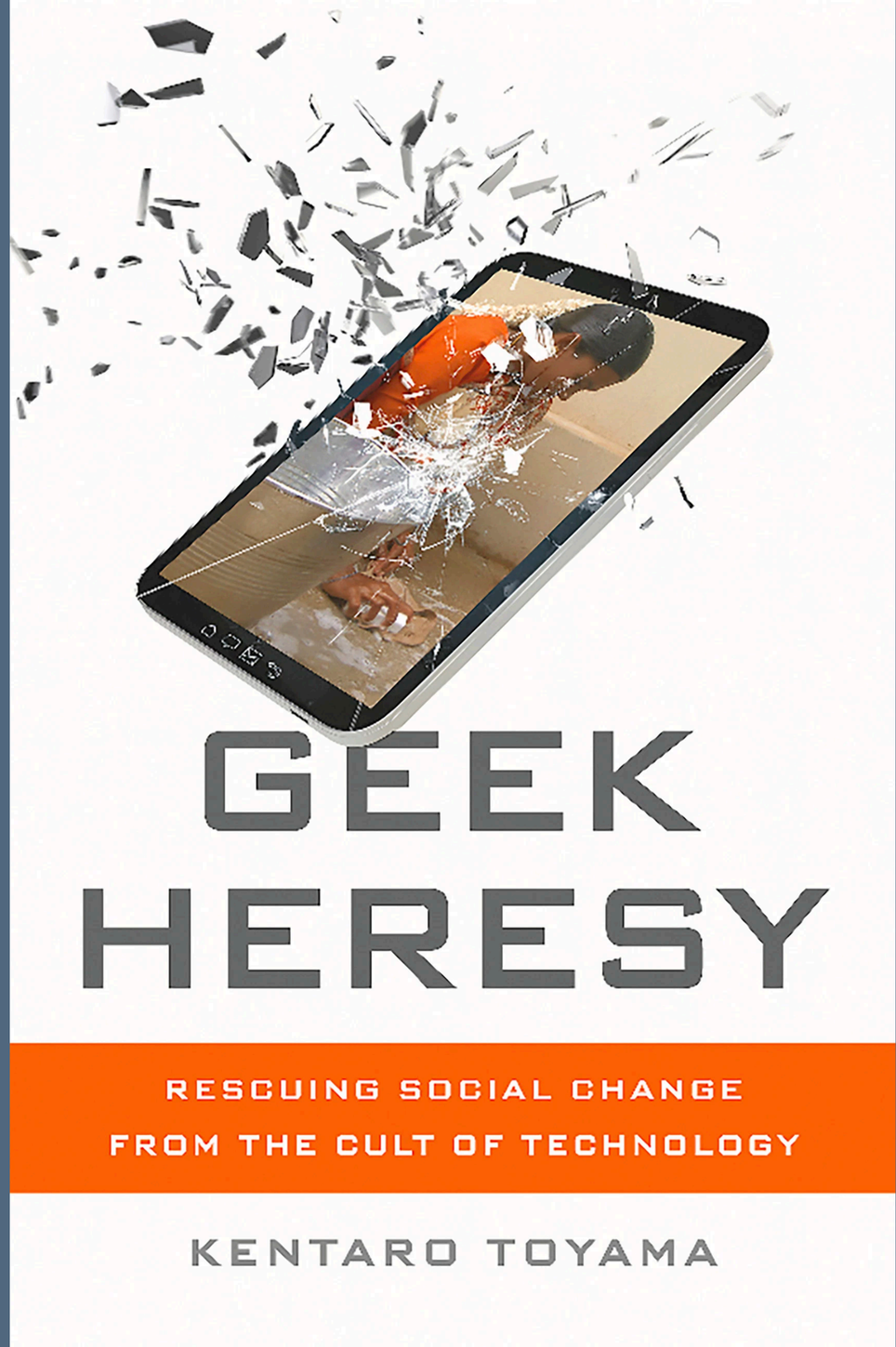
Geek heresy

[Toyama 2015]

After a decade designing ICT4D tech, Toyama argues that transformative change cannot rely on tech alone.

A reflective book: the technologies that Toyama and his team created were most effective for high-capacity organizations, not for their intended users.

His argument: **invest effort in people, not tech**

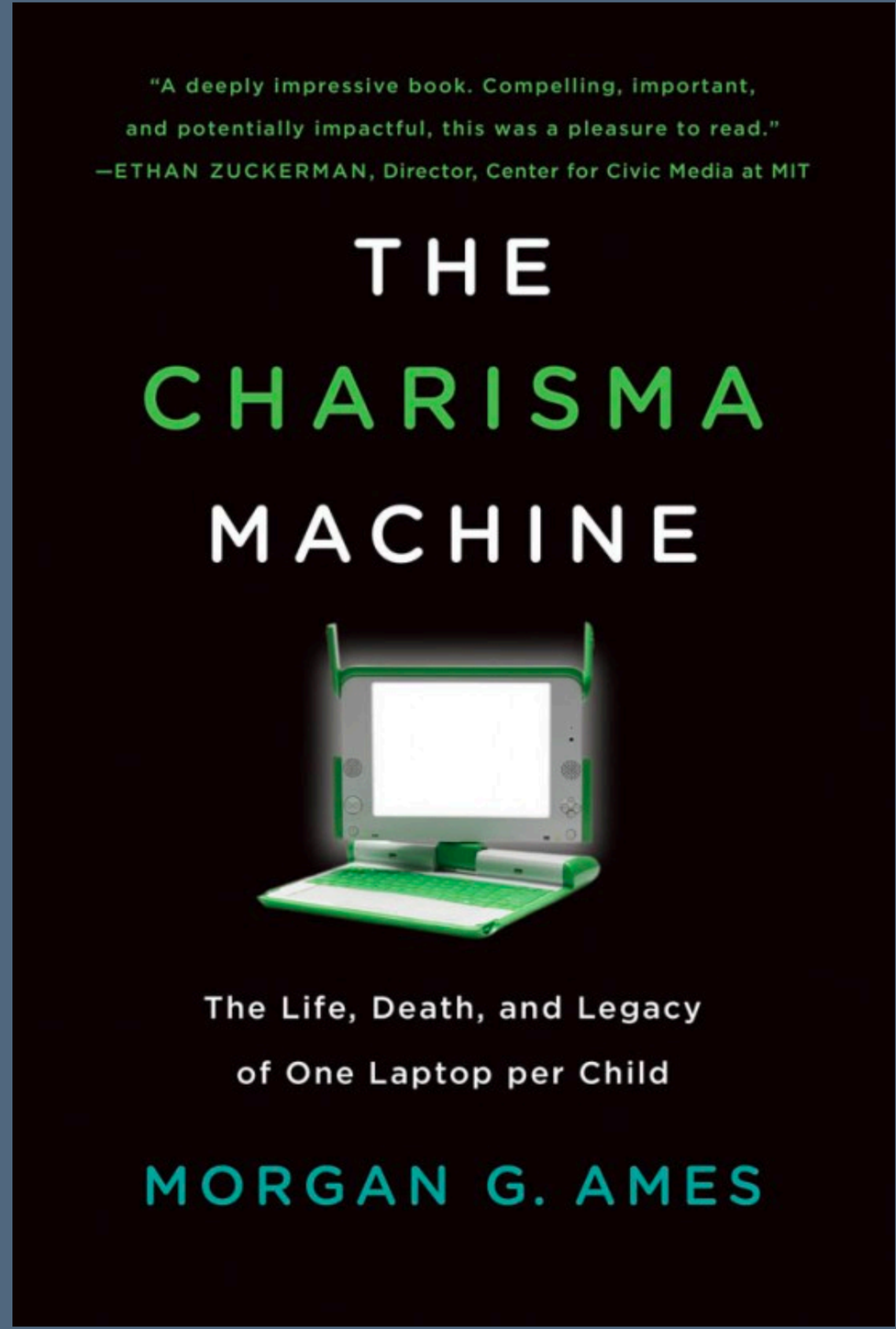


Tech charisma

One Laptop Per Child: a low-cost computer promised to transform education in developing regions

The project failed miserably, but its vision remains **charismatic** and inspires similar visions of ICT4D efforts today

How can we make technological contributions without falling into the techno-solutionist trap?



Summary

ICT4D seeks designs that can increase capacity worldwide, and especially in developing or under-resourced regions

To achieve this, ICT4D **re-examines our design assumptions**: what might appropriately designed technology (or non-technology) look like for these groups?

However, as it does so, ICT4D must wrestle with the crucial question of **whose values** are being encoded into these interventions

References

Ahmed, Syed Ishtiaque, et al. "Digital privacy challenges with shared mobile phone use in Bangladesh." Proceedings of the ACM on Human-Computer Interaction 1.CSCW (2017): 1-20.

Ames, Morgan G. The charisma machine: The life, death, and legacy of One Laptop per Child. Mit Press, 2019.

Brewer, Eric, et al. "The case for technology in developing regions." Computer 38.6 (2005): 25-38.

Cross, Andrew, et al. "99DOTS: a low-cost approach to monitoring and improving medication adherence." Proceedings of the Tenth International Conference on Information and Communication Technologies and Development. 2019.

Dell, Nicola, and Neha Kumar. "The ins and outs of HCI for development." Proceedings of the 2016 CHI conference on human factors in computing systems. 2016.

Dell, Nicola, et al. ""Yours is better!" participant response bias in HCI." Proceedings of the sigchi conference on human factors in computing systems. 2012.

Dell, Nicola, et al. "Digitizing paper forms with mobile imaging technologies." Proceedings of the 2nd ACM Symposium on Computing for Development. 2012.

Heimerl, Kurtis, and Eric Brewer. "The village base station." Proceedings of the 4th ACM workshop on networked systems for developing regions. 2010.

References

Irani, Lilly, et al. "Postcolonial computing: a lens on design and development." Proceedings of the SIGCHI conference on human factors in computing systems. 2010.

Marathe, Megh, et al. "Revisiting CGNet Swara and its impact in rural India." Proceedings of the Seventh International Conference on Information and Communication Technologies and Development. 2015

Medhi, Indrani, et al. "Designing mobile interfaces for novice and low-literacy users." ACM Transactions on Computer-Human Interaction (TOCHI) 18.1 (2011): 1-28.

Mudliar, Preeti, Jonathan Donner, and William Thies. "Emergent practices around CGNet Swara, voice forum for citizen journalism in rural India." Proceedings of the Fifth International Conference on Information and Communication Technologies and Development. 2012.

Okolloh, Ory. "Ushahidi, or 'testimony': Web 2.0 tools for crowdsourcing crisis information." Participatory learning and action 59.1 (2009): 65-70.

Patel, Neil, et al. "Avaaj otalo: a field study of an interactive voice forum for small farmers in rural india." Proceedings of the SIGCHI conference on human factors in computing systems. 2010.

Smyth, Thomas N., et al. "Where there's a will there's a way: mobile media sharing in urban india." Proceedings of the SIGCHI conference on Human Factors in computing systems. 2010.

Toyama, Kentaro. "Can technology end poverty." Boston Review 36.5 (2010): 12-29.

References

Toyama, Kentaro. Geek heresy: Rescuing social change from the cult of technology. PublicAffairs, 2015.

Wulf, Volker, et al. "'On the ground'in Sidi Bouzid: investigating social media use during the Tunisian revolution." Proceedings of the 2013 conference on Computer supported cooperative work. 2013.