

ICT4D

Information and Communications Technologies for Development

CS 347

Michael Bernstein

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 the iPhone...much less 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 Nedeveschi

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 Goals that the United Nations established in 2000 (<http://www.org/millenniumgoals>), one stands out: “Make available the benefits of new technologies—especially information and communications technologies.”

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. We believe that technology has a large role to play in developing regions, that “First World” technology to date has been a poor fit in these areas, and that there is thus a need for technology research for developing regions.

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

The World Bank’s infoDev site catalogs hundreds of information and communications technologies (ICT) projects (<http://www.infodev.org>), albeit

“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 technology development.

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

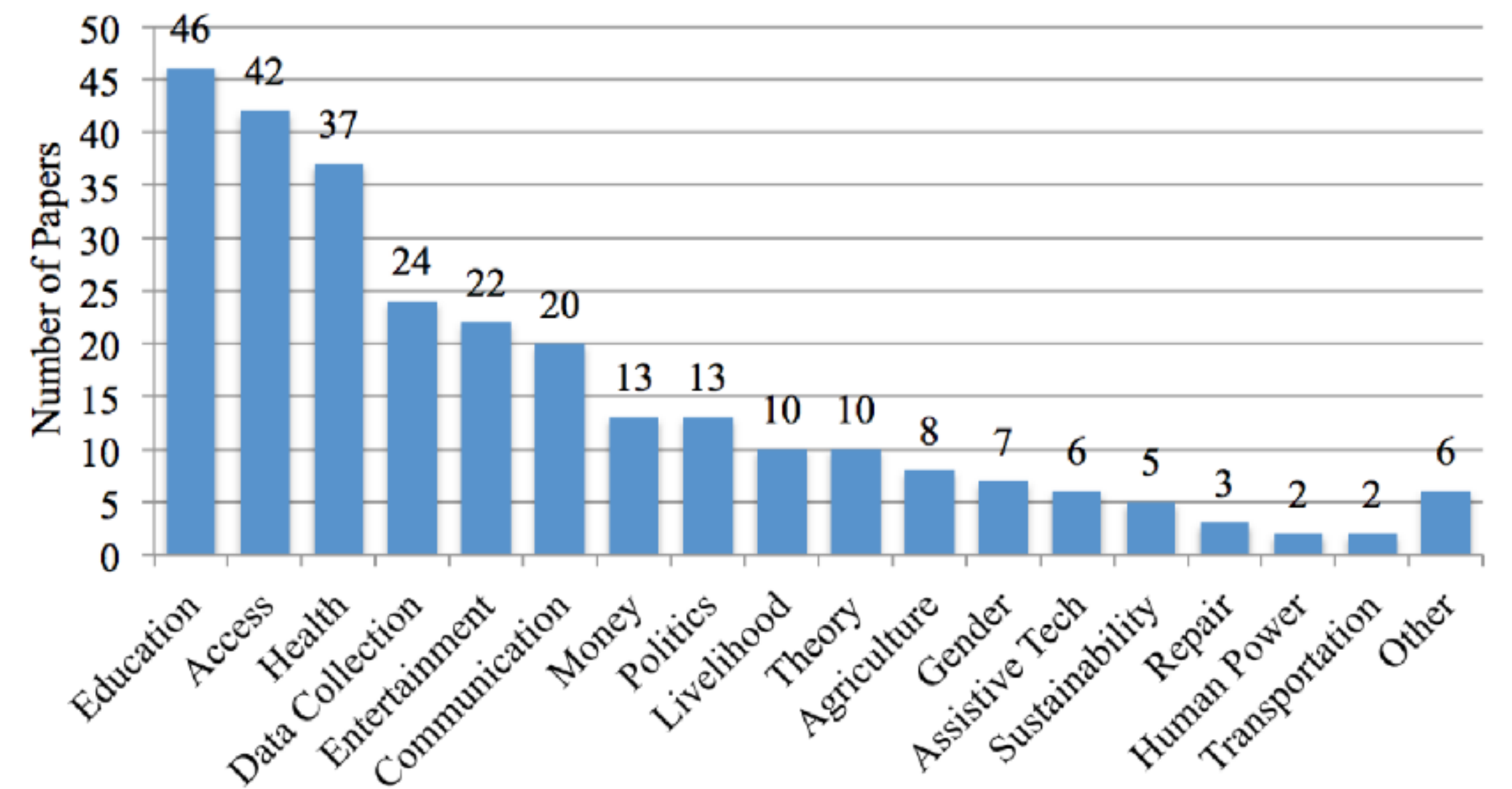
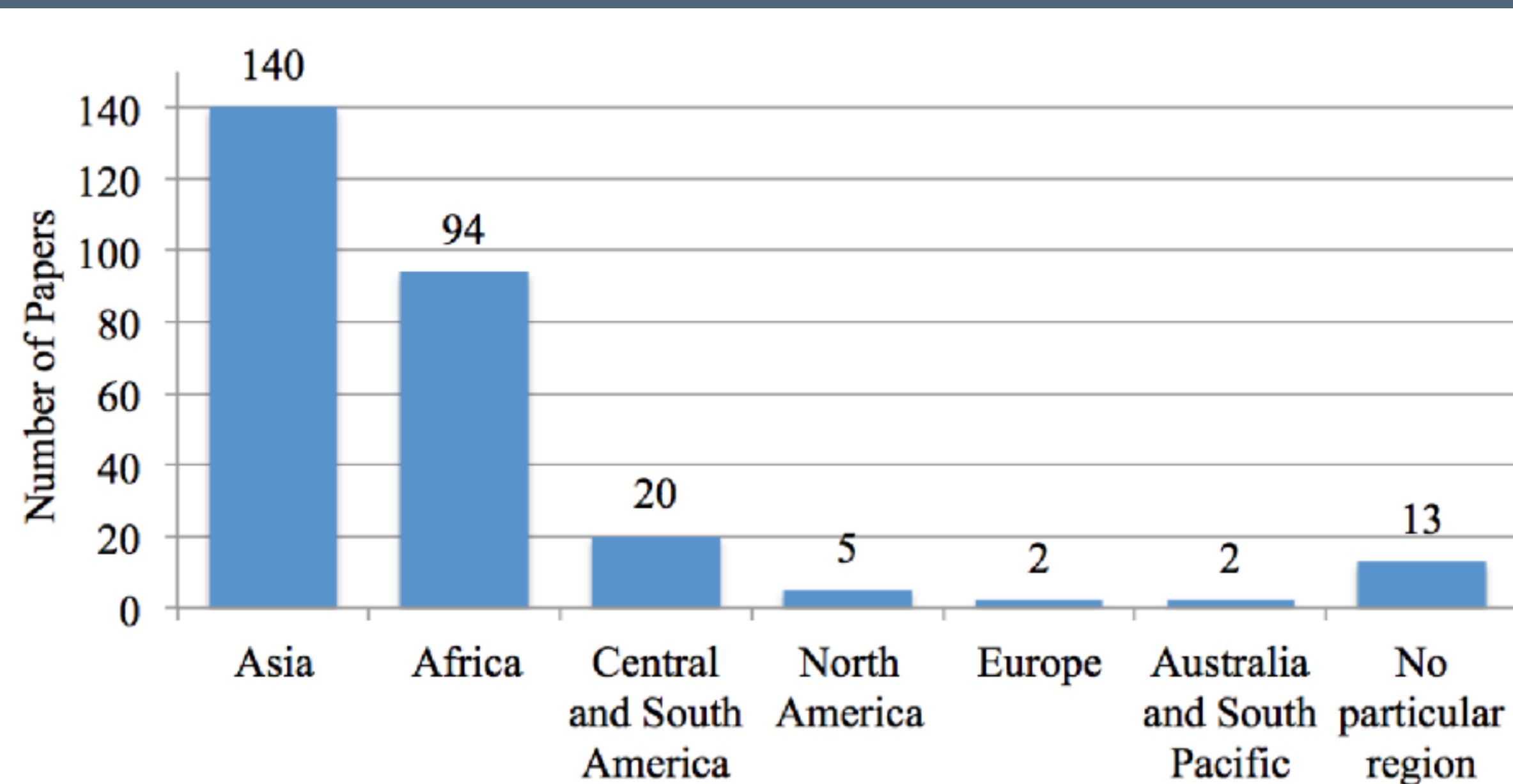
“Bahut acchaa!” I cheered—“very good.”

It was April, 2004, and I was visiting a “telecenter” in the tiny village of Retawadi, 120 hours from Mumbai. The small, dirt-floored room, lit only by an open aluminum doorway, was bare except for a desk, a chair, a PC, an inverter, and a large tubular battery, which powered the PC when grid electricity was unavailable. Outside, a humped cow chewed on dry stalks, and a goat bleated feebly.

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

YOU READ THIS

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

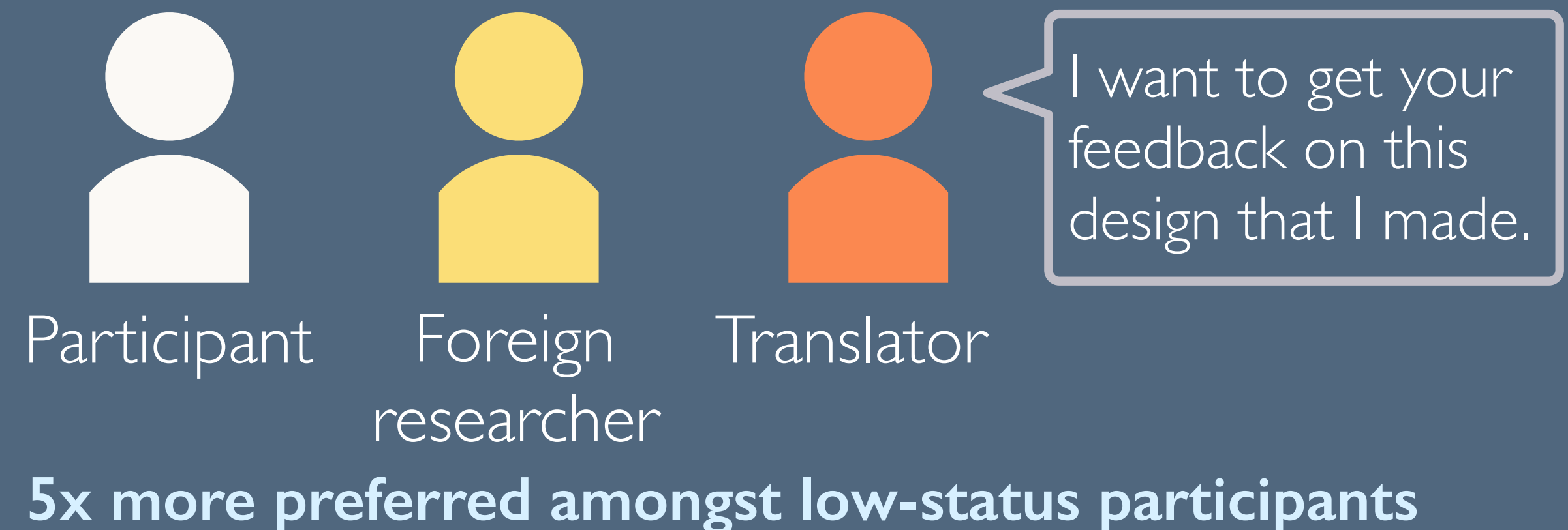
நேரடி மனித ஆபரேட்டர்கள் மிகவும் பயனுள்ளதாக இருக்கும், ஆனால் படத்தை அடிப்படையாகக் கொண்ட அல்லது பேச்சு அடிப்படையிலான தொடர்புகளும் வெற்றிபெறக்கூடும்

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**



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

Provincia: Mozambique
Distrito: Lusitana
US: Lusitana Código: 12345
Mês: Agosto Ano: 2011

Posto fixo ☒ Brigada móvel ☐

Ficha de registo diário do PAV para posto fixo ou brigada móvel - BCG, Polio, DTP-HepB-Hib

Vacinas	0 - 11 meses	Total	12 - 23 meses	Total	Frascos Abertos	Total
BCG	60	60	60	60	60	60
Polio	60	60	60	60	60	60
DTP-HepB-Hib	60	60	60	60	60	60
Feminino	60	60	60	60	60	60
Masculino	60	60	60	60	60	60

Nome legível do responsável pelo preenchimento: _____

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Posto fixo ☒ Brigada móvel ☐

Ficha de registo diário do PAV para posto fixo ou brigada móvel - BCG, Polio, DTP-HepB-Hib e Sarampo

Vacinas	0 - 11 meses	Total	12 - 23 meses	Total	Frascos Abertos	Total
BCG	65	65	27	27	9	9
Polio	90	90	27	27	10	10
DTP-HepB-Hib	53	53	50	50	11	11
Feminino	41	41	27	27	12	12
Masculino	60	60	22	22	5	5
Sarampo	84	84	25	25	15	15
Feminino	41	41	25	25	5	5
Masculino	39	39	10	10	3	3
Sarampo	50	50	30	30	11	11

Nome legível do responsável pelo preenchimento: _____

Data: 2011/08/2011

Nota: O responsável pelo preenchimento é aquele que recebeu todas as vacinas antes de completar um ano de vida.

Supporting development efforts

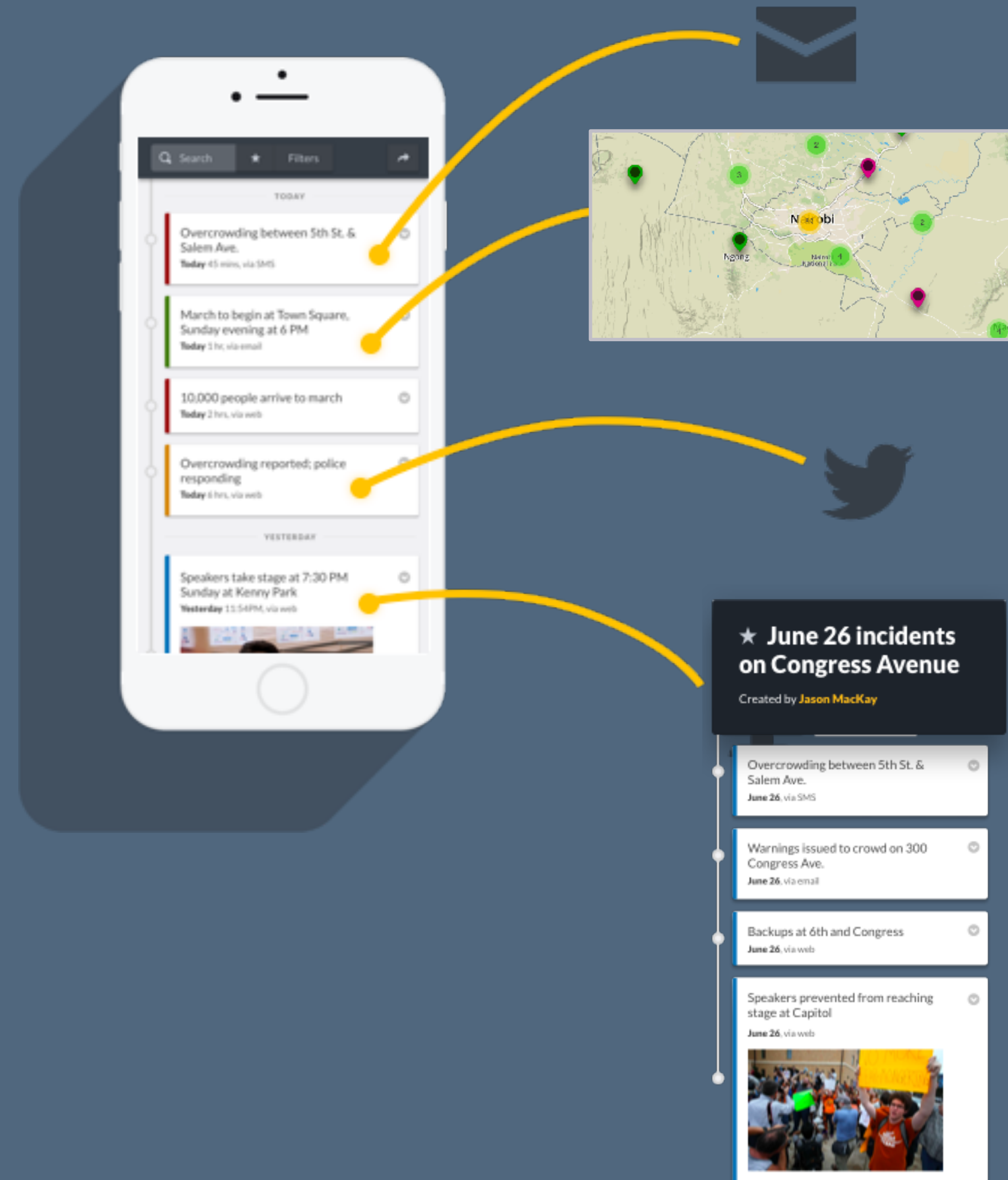
Rather than creating something entirely new, hook into existing capacity in the region

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

Technology as new versions of old problems

Many examples, but here's one.

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...

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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



Geek charisma

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

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

How do we better disentangle the charisma of the vision from the power of the actual idea?

"A deeply impressive book. Compelling, important, and potentially impactful, this was a pleasure to read."
—ETHAN ZUCKERMAN, Director, Center for Civic Media at MIT

THE CHARISMA MACHINE



The Life, Death, and Legacy
of One Laptop per Child

MORGAN G. AMES

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 question of
whose values are being encoded into these interventions

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