ICTD

Information and Communication Technologies for Development

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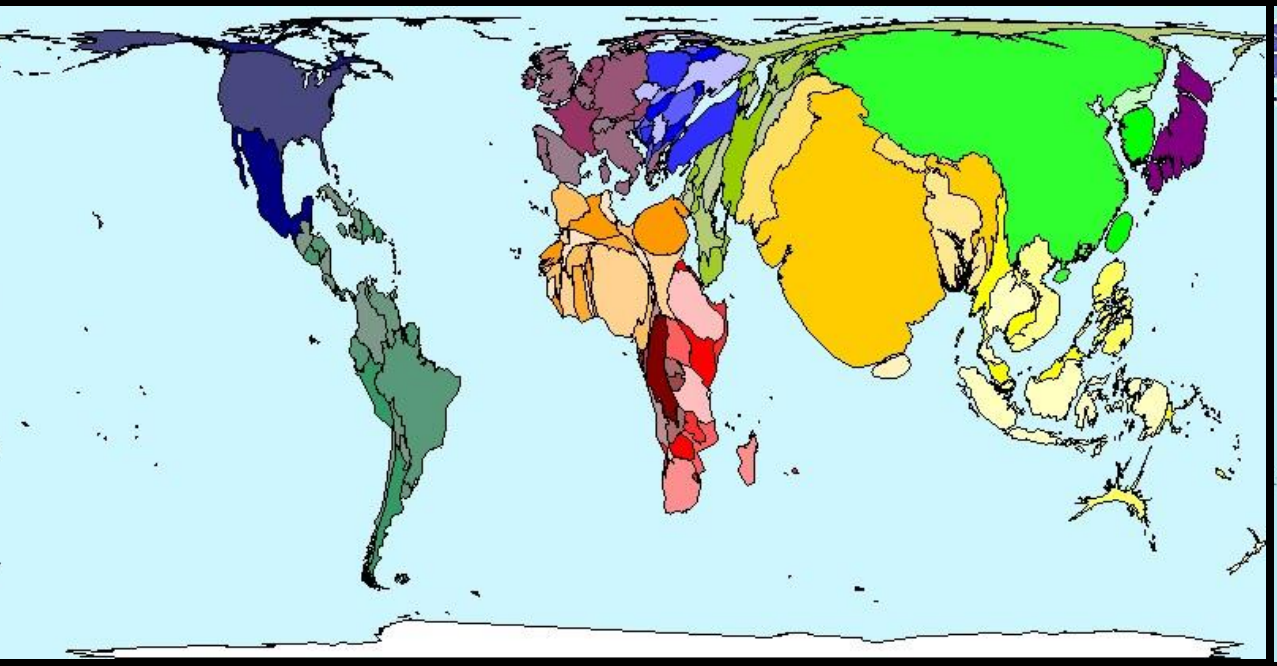
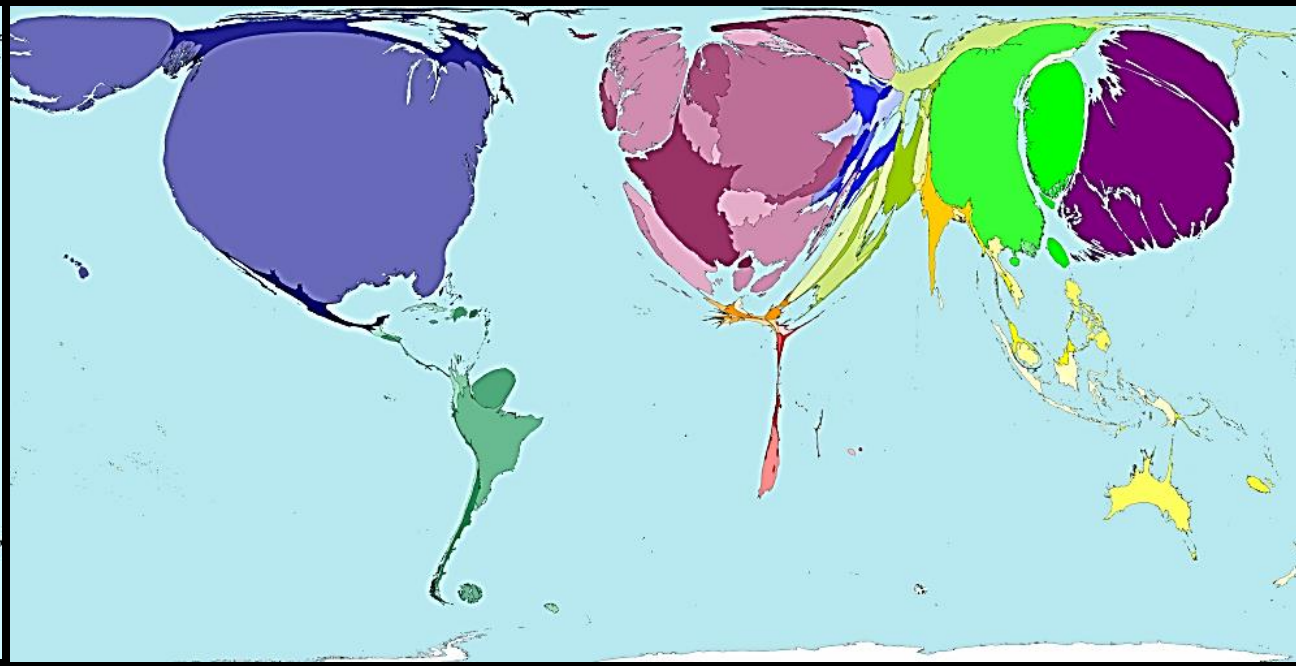
Technology Advances Primarily Benefited People in Developed Regions

World Population



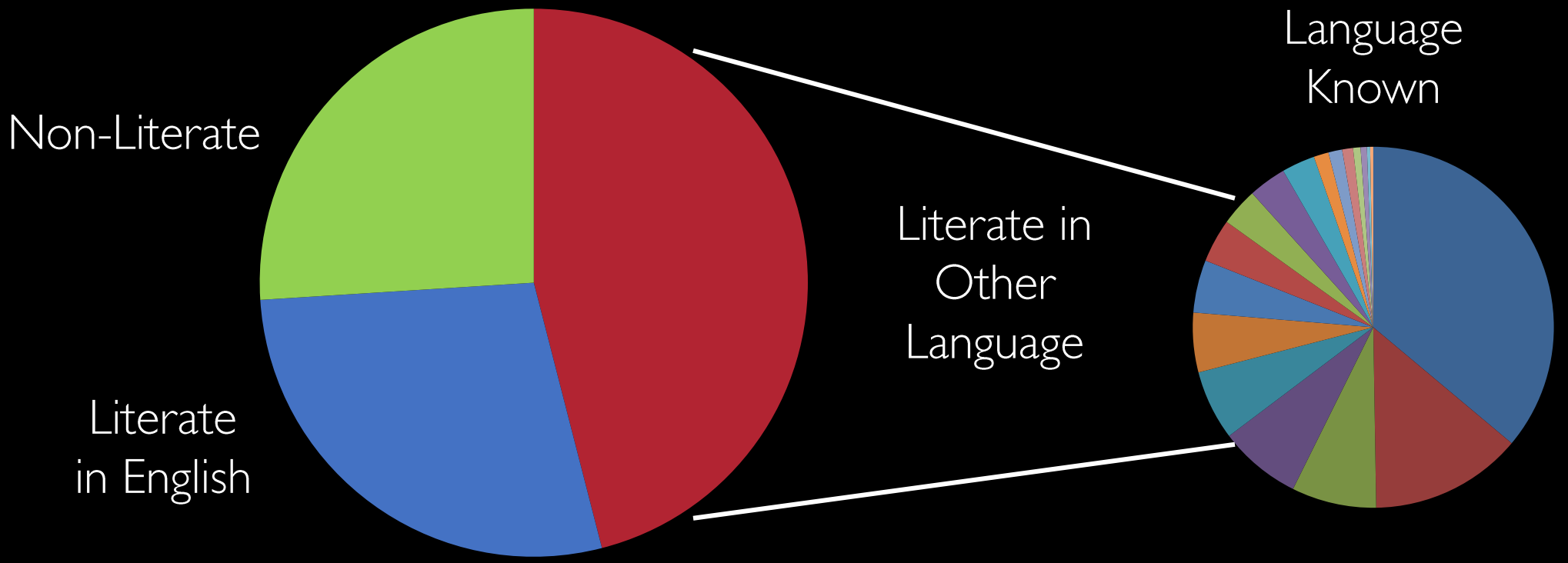
Science & Technology Investment

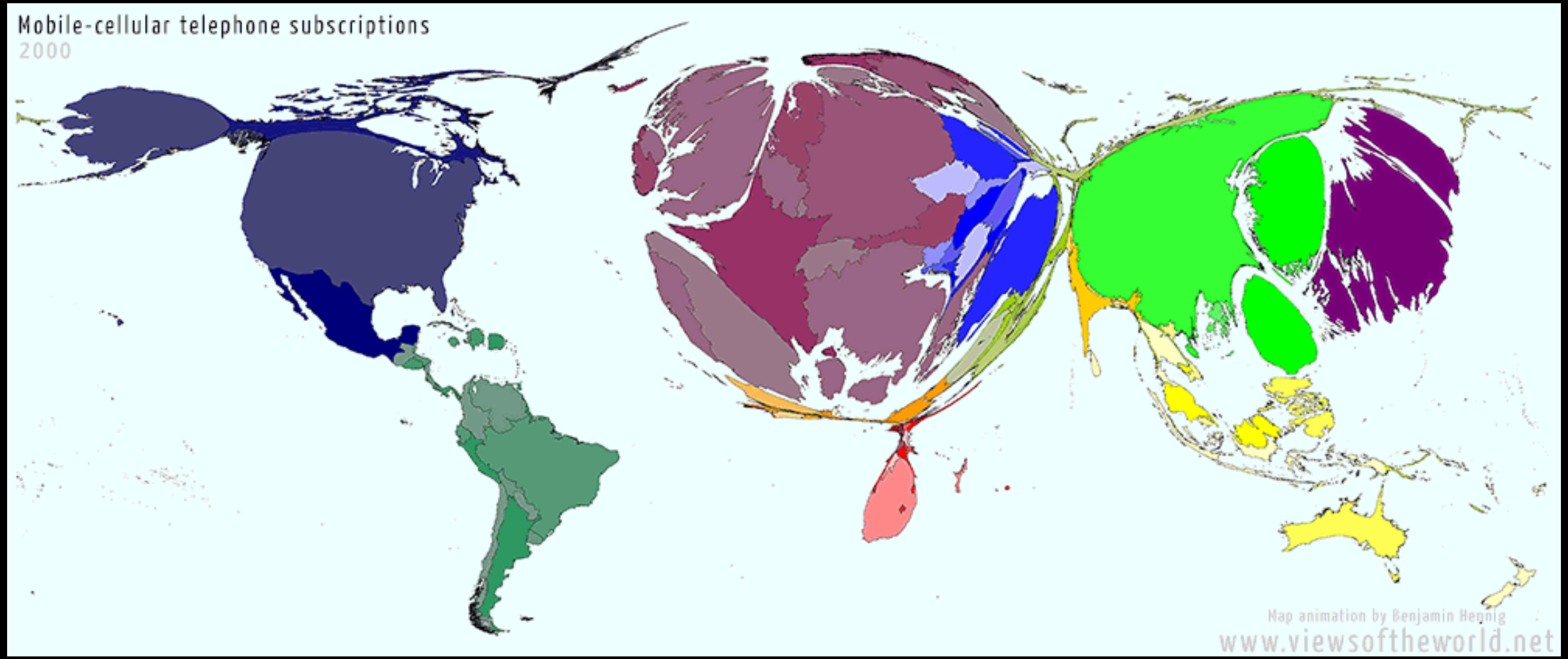


Resource-Constrained Environments

3 billion people live on < $2 per day

780 million people illiterate and billions more without functional literacy





1.7 billion women do not own a phone or computer

3.6 billion people have never used the Internet

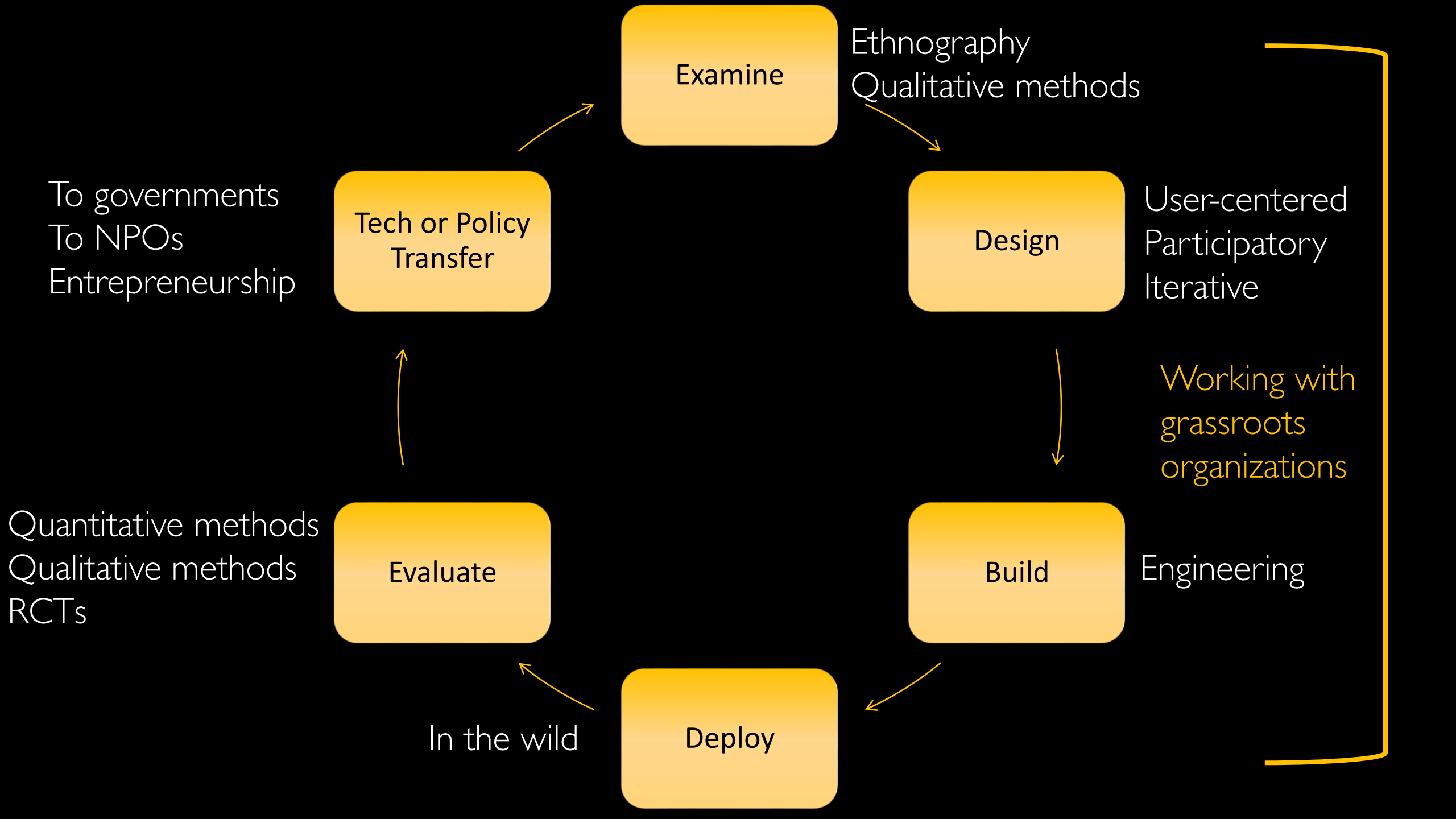
More than 50% phone subscribers use a basic or feature phone

ICTD

Global problems	Technology constraints	Diverse challenges
Agriculture	Computers	Literacy and language
Health	Mobile Devices	Socio-cultural norms
Poverty	Networks	Gender
Education	Connectivity	Politics
Human Rights	Energy and power	Accessibility
Conservation	Transport	Security and privacy

Technology alone is not enough!

Interdisciplinary: Computer Science, Design, Information Science, Geography, Science and Technology Studies, Public Policy, Engineering, Development Economics


Examine
Ethnography
Qualitative methods
Design
User-centered
Participatory
Iterative
Working with grassroots organizations
Build
Engineering
Deploy
In the wild
Evaluate
Quantitative methods
Qualitative methods
RCTs
Tech or Policy Transfer
To governments
To NPOs
Entrepreneurship

ICTD History

International Development (1960s)

- Marshall plan
- Institute of Inter-American affairs
- Founding of USAID

"Provide technical knowledge to aid the growth of underdeveloped countries

Internet in Developing World (1990s)

- Telecenters
- MDGs
- Micro-entrepreneurs
- Telemedicine

Now (2000s)

Industry

- Google Loon, Aquila, Free Basics
- IBM Kenya, MSR India

Academia

- UW, Cornell Tech, Georgia Tech, UC Berkeley, etc.

Non-profits/Start-ups

- Jana, BRCK, Ushahidi, Samasource

Donors

- USAID, BMGF, Humanity United

ICTD Burning Questions

What is development (e.g., Modernization theory, Structuralist theory, Freedom theory) ?

What role technology plays in development (e.g., amplification theory)?

Whom to empower and how (e.g., top down vs bottom-up design)?

What are the unintended consequences (e.g., early aid to Africa)?




Respeak

A Voice-based, Crowd-powered Speech Transcription System

Aditya Vashistha, Pooja Sethi and Richard Anderson

PAUL G. ALLEN SCHOOL
OF COMPUTER SCIENCE & ENGINEERING

DUB
DESIGN USE BUILD

Crowdsourcing Marketplaces

Providing Additional Income to People with Basic Skills

SIDE HUSTLE NATION

Start Here Blog Podcast About

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Mechanical Turk Review: How I Made $21,000 a Quarter at a Time

35 13 22 3K

Mike Naab is an analyst, writer and online entrepreneur with a unique, open-to-almost-anyone side hustle: completing tasks on Amazon's Mechanical Turk.

Mike is such a successful "Turkey" (my made-up nickname) he even wrote a book on the subject: Side Hustle From Home: How To Make Money Online With Amazon Mechanical Turk.

I've used mturk as a buyer before, but never as a income stream. Read on to hear how Mike has turned his free time into

Budgets are $oxy

"A personal finance blog that won't put you to sleep." - Benjamin Franklin

As Seen In... The New York Times Kiplinger TIME msn U.S.News Forbes

home | about | free budget templates | challenge everything! | money experiments | my net worth | best apps & tools

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I've Made $20,000 Through Amazon's Mechanical Turk

by J. MONEY on FRIDAY, MARCH 18, 2016

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- For insurance: USAA
- For investing: Vanguard
- For investing automatically: Acorns
- For saving money automatically: Digit
- For getting your money *back*: Paribus
- For cheap cell plans: Republic Wireless
- For budgeting: You Need A Budget (YNAB)
- For tracking money/worth: Personal Capital

MTurk in India

{HINDI} Making Money with Amazon Mechanical Turk at

Cyber Baba

8.4K views

how to earn by working on amazon mturk micro jobs in

My Smart Support

143K views

amazone mturk in hindi ,Earn $50 Everyday , Step by Step

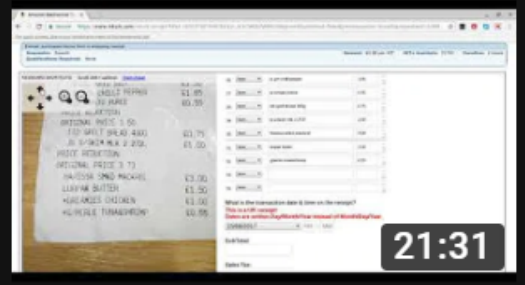
DG Tech

5.1K views

Earn money online with amazon mechanical turk in

mana telugu tech

18K views



Work From Home Typing Data With Amazon!

Shaneka's Intuitive Tarot Readings

539 views

How to Make Money Online Through Amazon Mturk

Ecom-Tech Ka Tadka

61K views

Inappropriate in Resource-Constrained Settings

97% of the households without access to Internet connected computer

47% of the population does not have a bank account

72% of the population is illiterate in English

What should be a compelling problem that can be divided into voice-based microtasks and generate $$$

Speech Transcription
More than $60 Billion Industry

Hindi
Speech

Hindi
Text

Existing Solutions: Inadequate and Expensive

1. Professional Manual transcription

- Need trained workforce
- High turnaround time
- USD 1-4 per minute

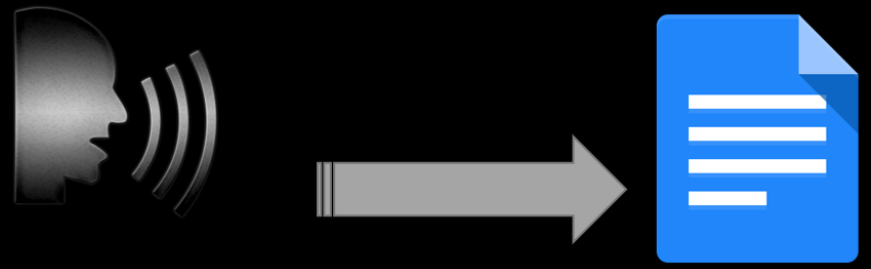
2. Professional services using crowdsourced labor

SPEECHPAD

TranscribeMe!

- USD 1-6 per minute
- Support only well-represented languages like English & Spanish

3. Automatic Speech Recognition



- Poor accuracy when untrained
- Poor accuracy (< 50%) for noisy files

Expensive and time consuming for languages and accents spoken in developing countries like Hindi and Indian English

Research Goal

- Design Crowdsourcing marketplace for low-income, low-literate communities in developing regions
  - Voice-based, Phone-based, Processes mobile airtime

- Facilitate cost-effective, time-efficient and high-accuracy transcription for resource-constrained languages and accents
  - Hindi (more than 450 million speakers)
  - Indian English (more than 130 million speakers)

Respeak's Design – The Engine

Step 1: Segmentation

Large audio file

They changed their minds because they observed how the Olympic Games were working in Rio. We had security for people in the Olympic Park…..we had efficient public transportation.

Step 2: Distribution to blind App users

Short audio segments

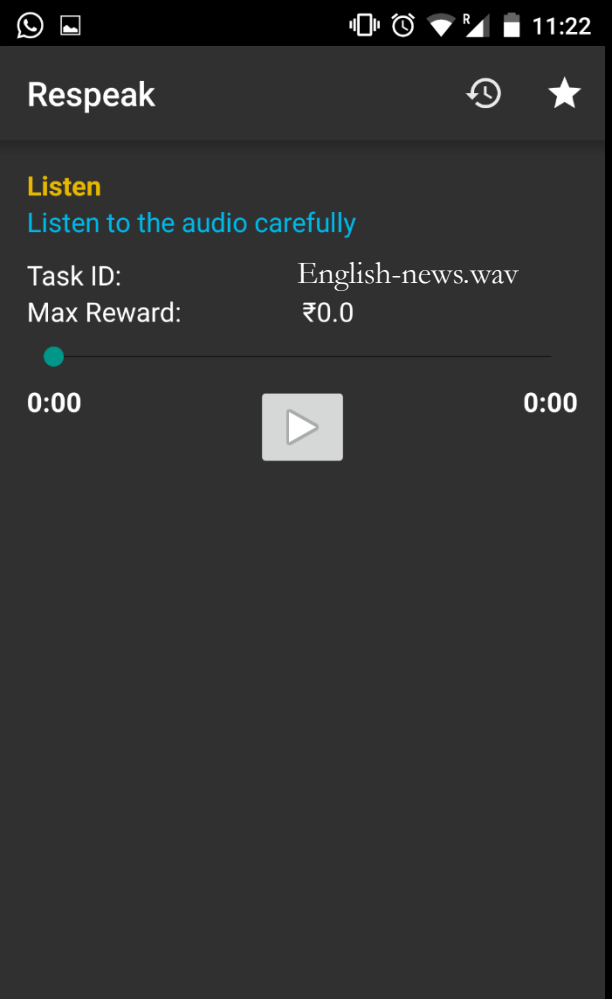
They changed their minds because they

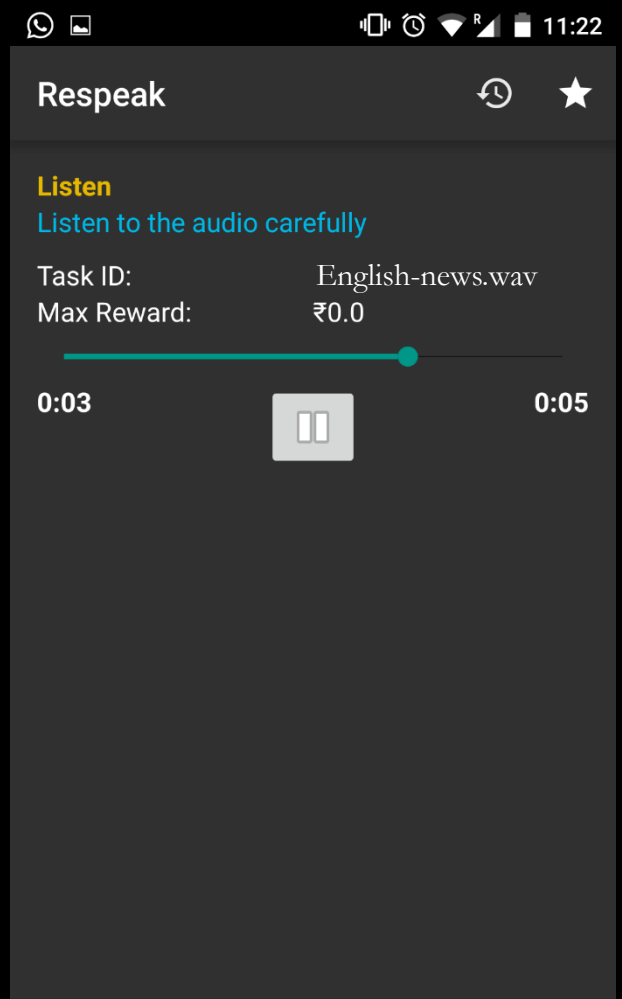
observed how the Olympic Games were working in Rio

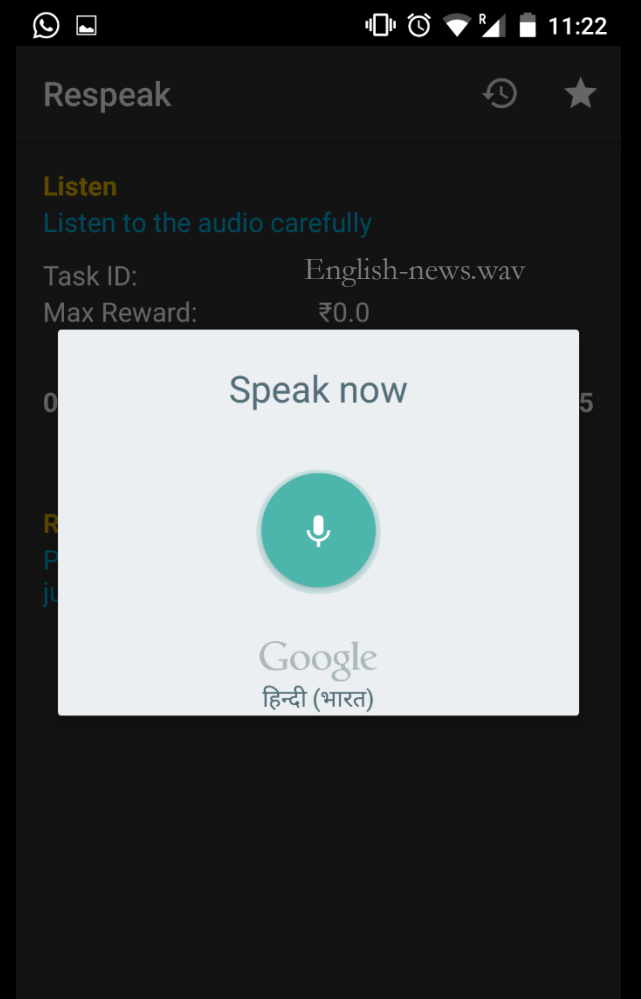
We had security for people in the Olympic Park

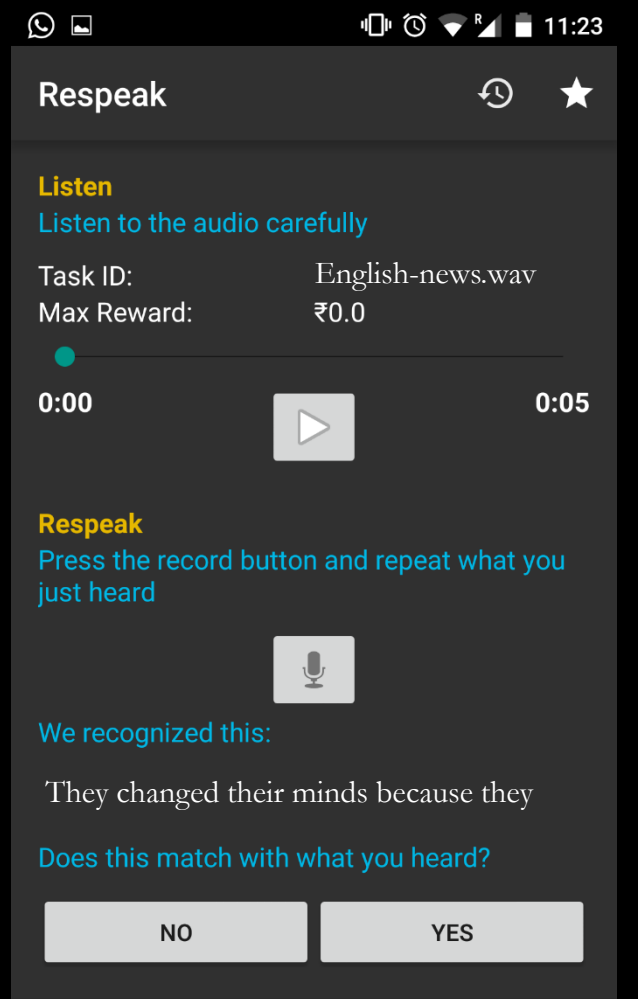
Respeak's Design – The Smartphone App

Step 3: User Perform Tasks









Respeak's Design – The Smartphone App

Step 3: User Perform Tasks

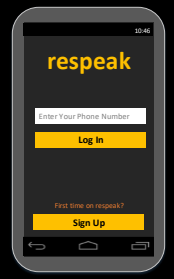
Respeak's Design – The Engine

Transcripts generated by re-speaking the segment

Short audio segment:

They changed their minds because they

The changed their blinds they



They changed their minds because

They change the minds because they

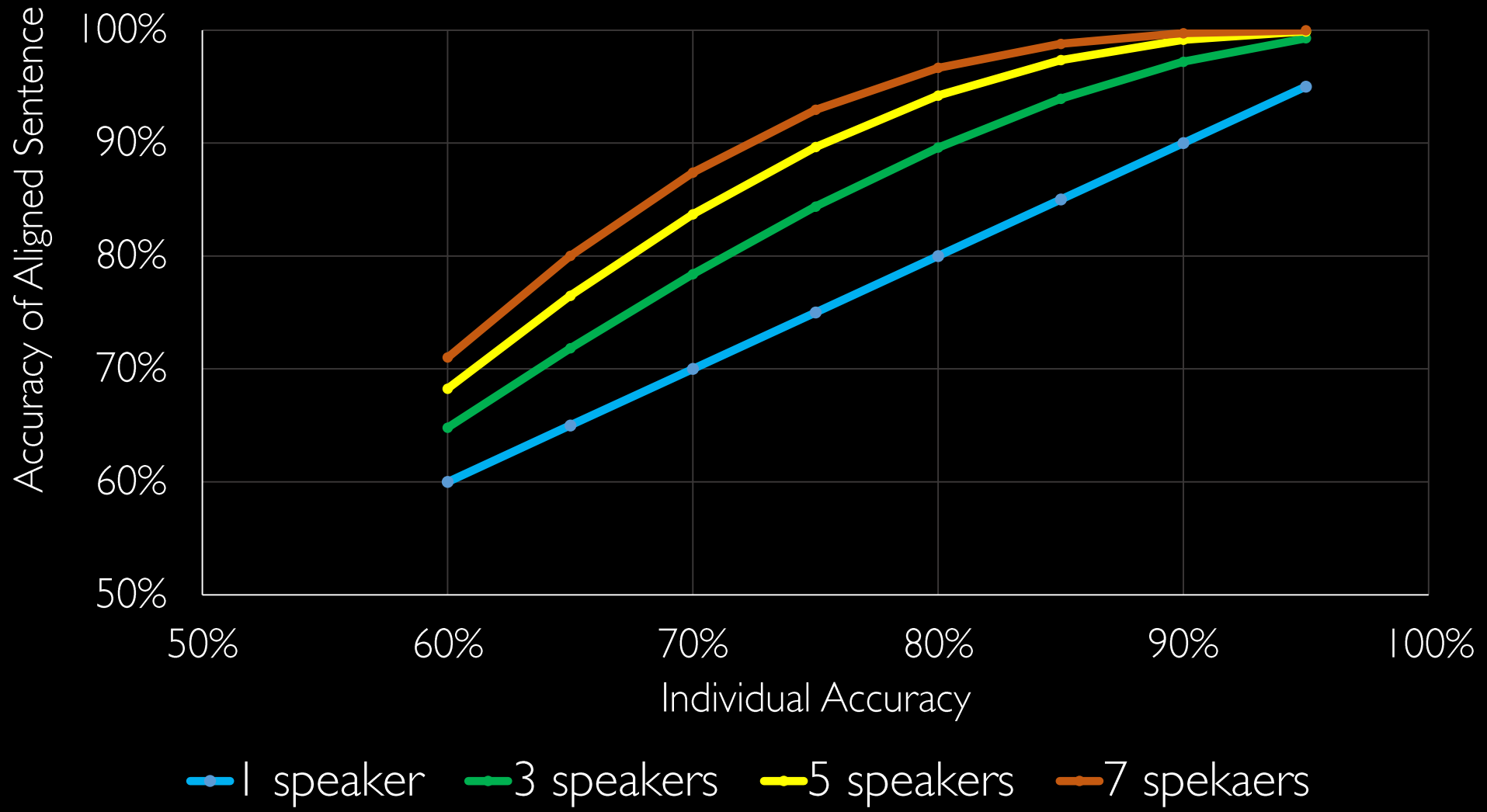
Step 4: Merging using MSA and majority voting

the	changed	their	blinds	-----	they
they	changed	their	minds	because	-----
they	change	the	minds	because	they
they	**changed**	**their**	**minds**	**because**	**they**

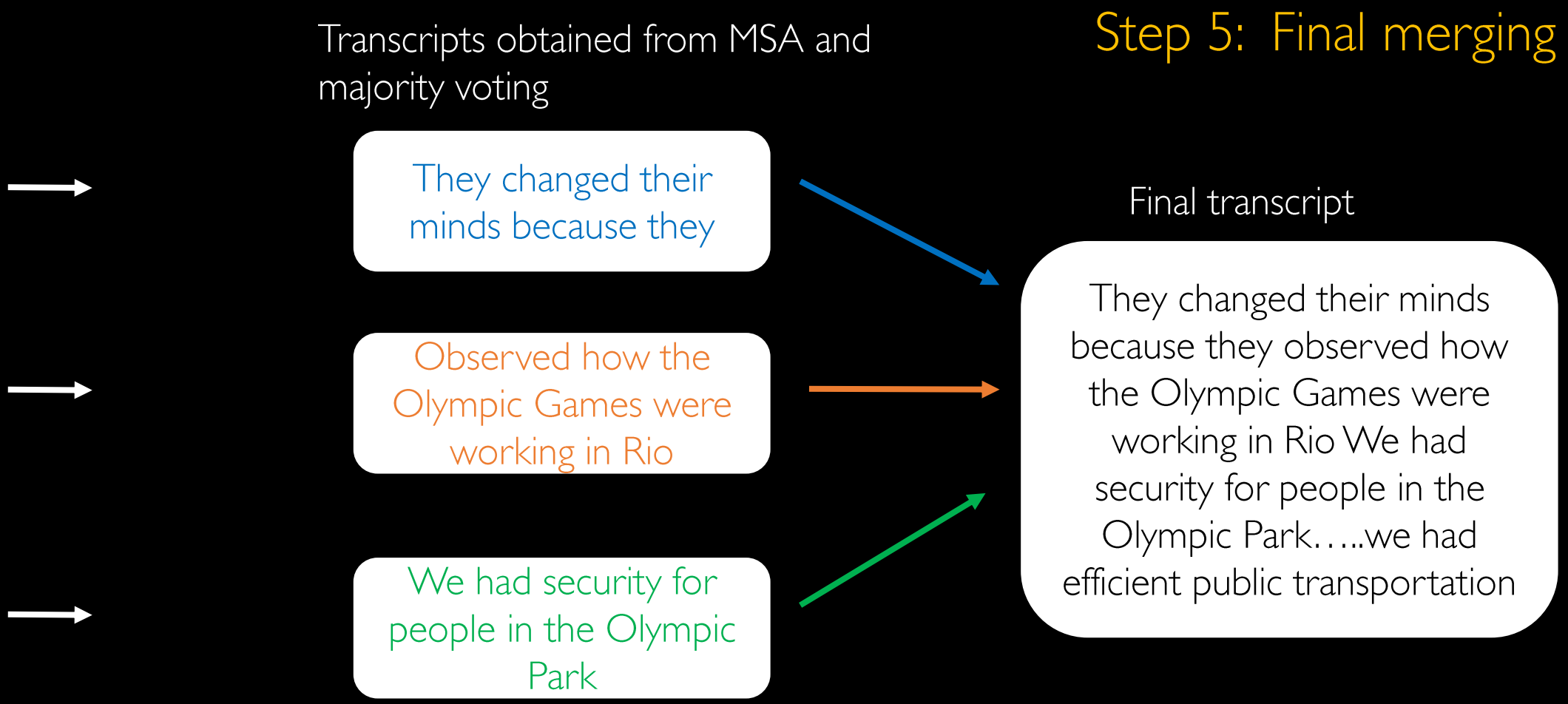
Best estimation transcript for the segment

They changed their minds because they

Multiple Sequence Alignment and Majority Voting



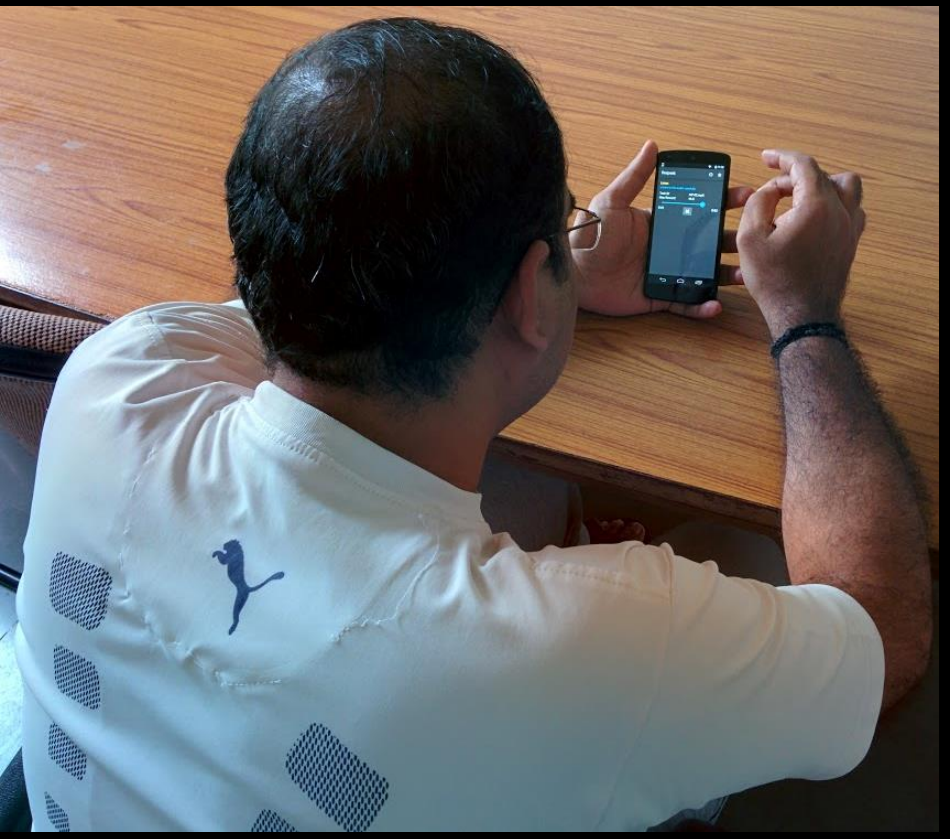
Respeak's Design – The Engine



Cognitive Experiments with 24 Participants

1. Whether speaking is indeed more efficient and usable output medium than typing?
   - Speaking outperformed both computer and phone typing on time taken, speed, accuracy, and on all usability parameters
2. How audio files should be segmented and how their length affects content retention and cognitive load?
   - Less than 6 seconds
3. Should the segments be presented in a sequential or random order to improve content retention and reduce cognitive load?
   - Sequential order

One-Month Deployment in India



25 university students

- 20 male, 5 female
- 15 were financially dependent on family members
- All had smartphones and the Internet (college WIFI)

13 Hindi and 8 English files

- Interviews, songs, TV ads, news, public speeches, phone calls, YouTube videos, online lectures
- 55 minutes
- 756 micro-tasks
- Reward amount: 60 paisa to 1.2 INR per micro-task

Deployment Results

24 users completed 5,400 times to earn 3040 INR

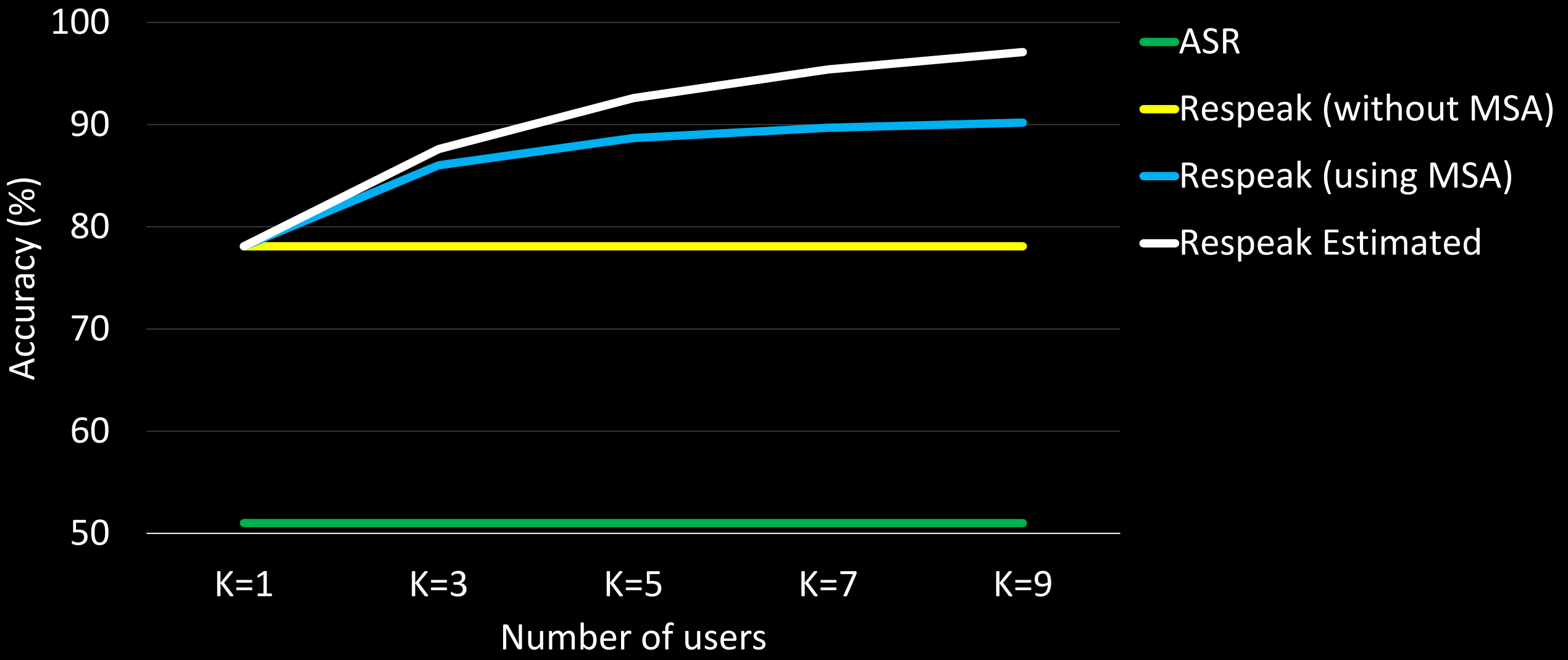
Avg. ASR accuracy
77%

Transcription accuracy
(after using MSA)
English: 85%
Hindi: 92%

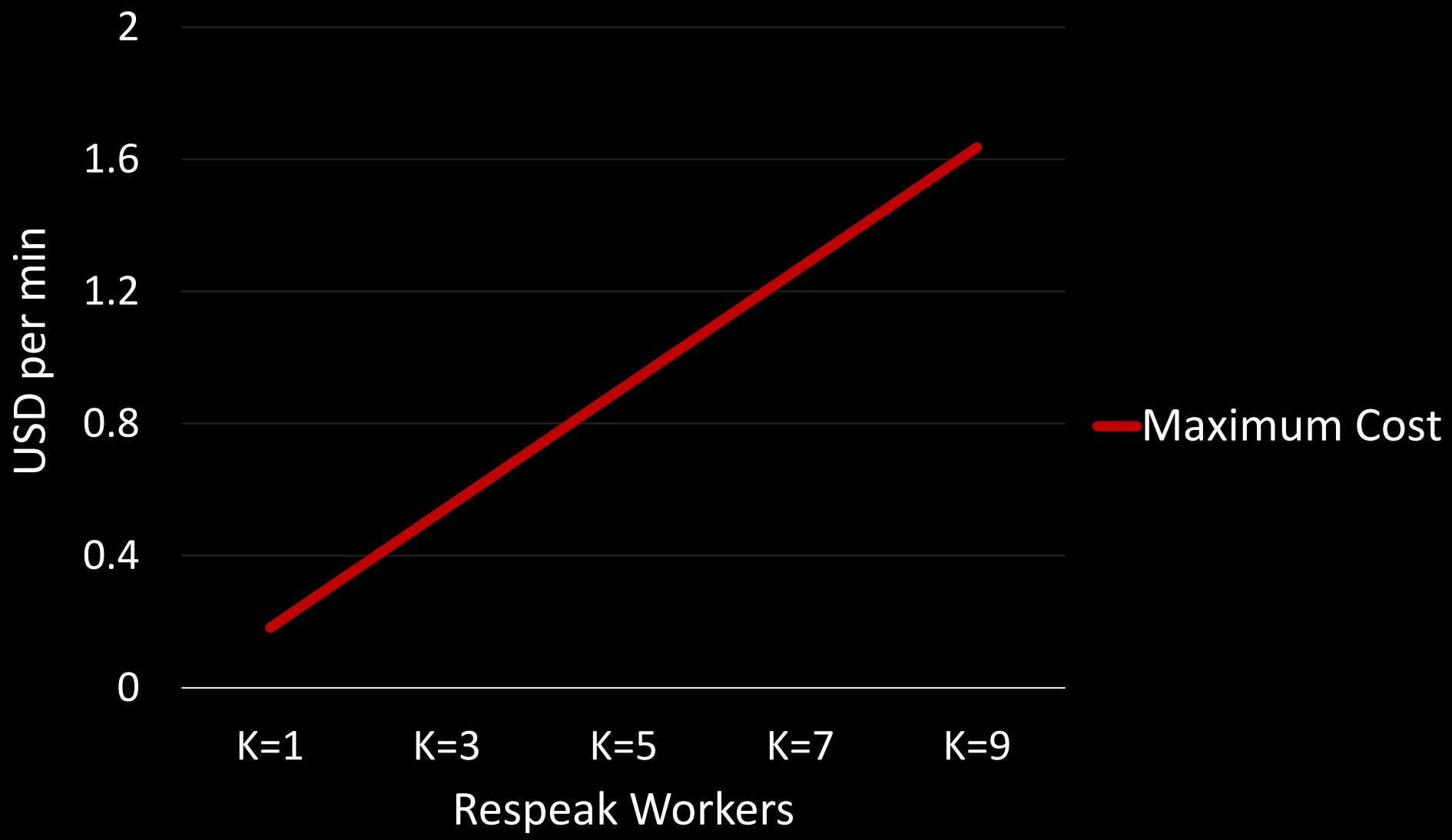
Transcription cost
$0.83 per minute

User earnings
INR 76 per hour

Performance and Cost Analysis



Performance and Cost Analysis



Performance for Different Content Types

Content Type	Accuracy for 5 users (%)
Song, News, YouTube video	92
Public speech	91
Online lecture	90
Phone call	87
Interview	84
TV ad	80

Unclear voice

Multiple speakers

Unfamiliar accent

I had to speak cheesy lines like, "My heart is beating for you". My parents overheard me and asked me, 'Who are you talking to; what is going on?' It was awkward to explain.

Financial and Instrumental Benefits

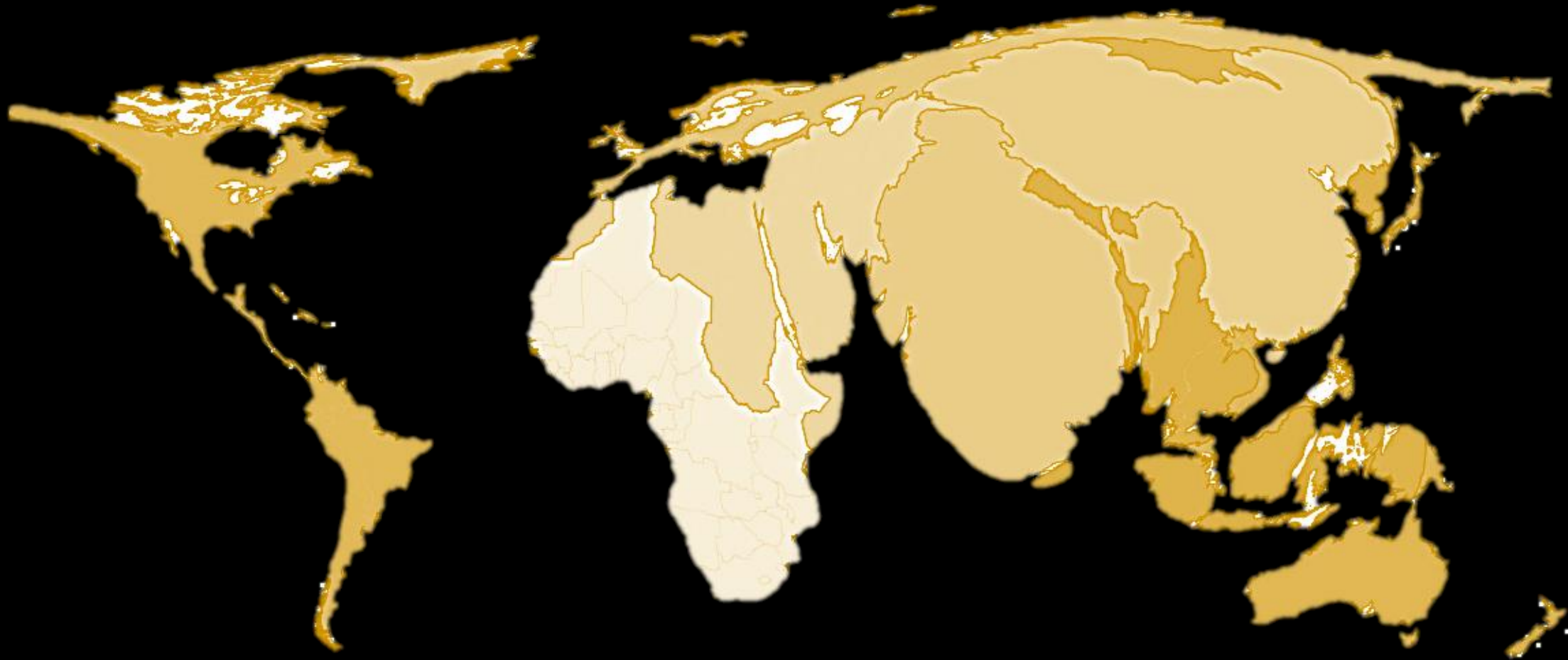
I exhausted my phone balance while chatting with a friend. I did not have money to refill my phone online. I quickly did some tasks on Respeak using free WIFI, received a top-up, and then called him!

P2 (Male, 21 years)

Receiving a mobile recharge was good. However, listening to speeches and interviews increased my general knowledge. Most importantly, the application improved my pronunciation as I was focusing to pronounce words better so that they get recognized.

P3(Male, 23 years)

90% of the World's Visually Impaired People Live in Low-income Settings



Inappropriate in Resource-Constrained Settings

97% of the households without access to Internet connected computer

47% of the population does not have a bank account

72% of the population is illiterate in English

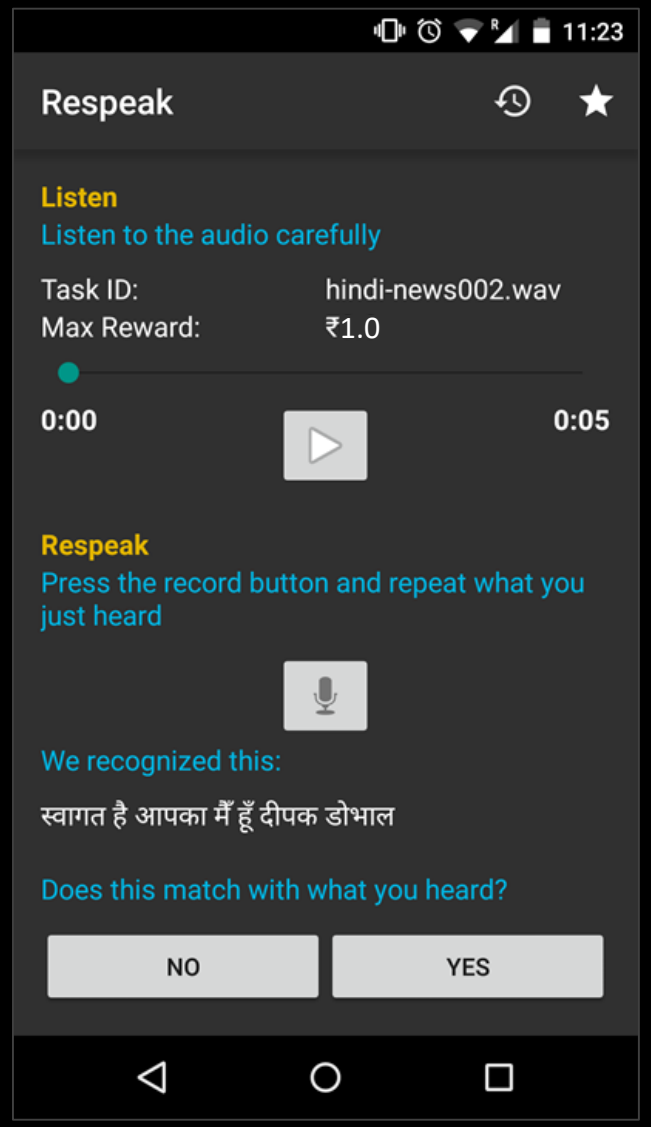
Zyskowski et al. CSCW'15

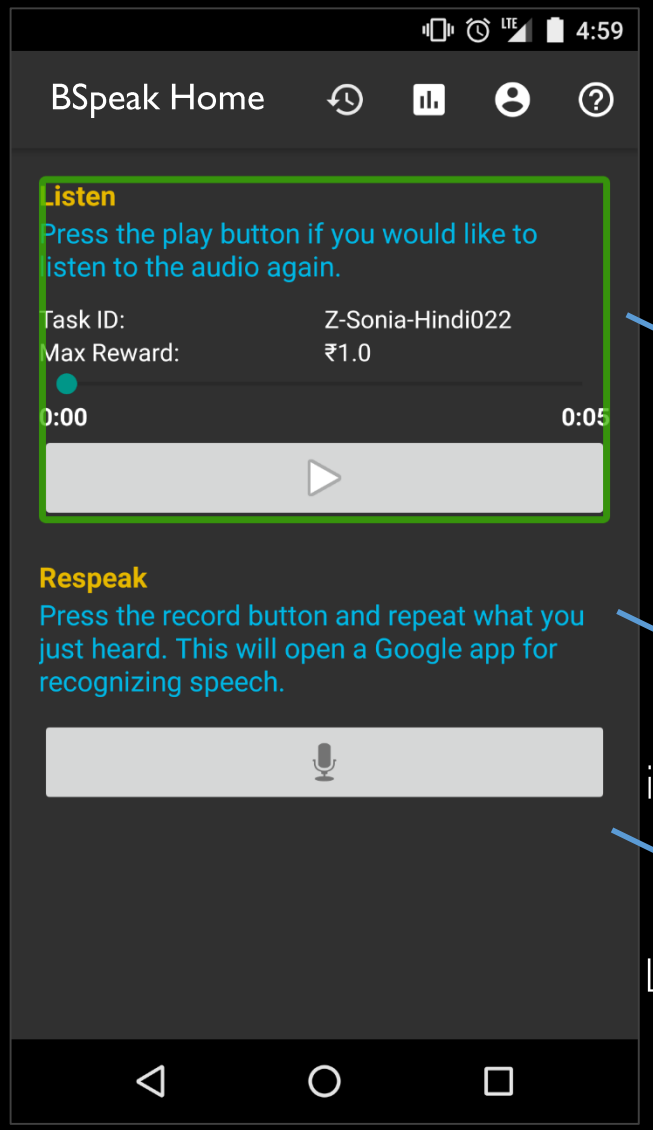
- Incomplete task descriptions
- Inaccessible task features
- Time restrictions
- Visual captchas

BSpeak: Accessible Version of Respeak

BSpeak at CHI 2018

- Adapted Respeak app to make it accessible for the visually impaired
- How a voice-based phone-based design could be a usable, accessible, and feasible alternative to MTurk



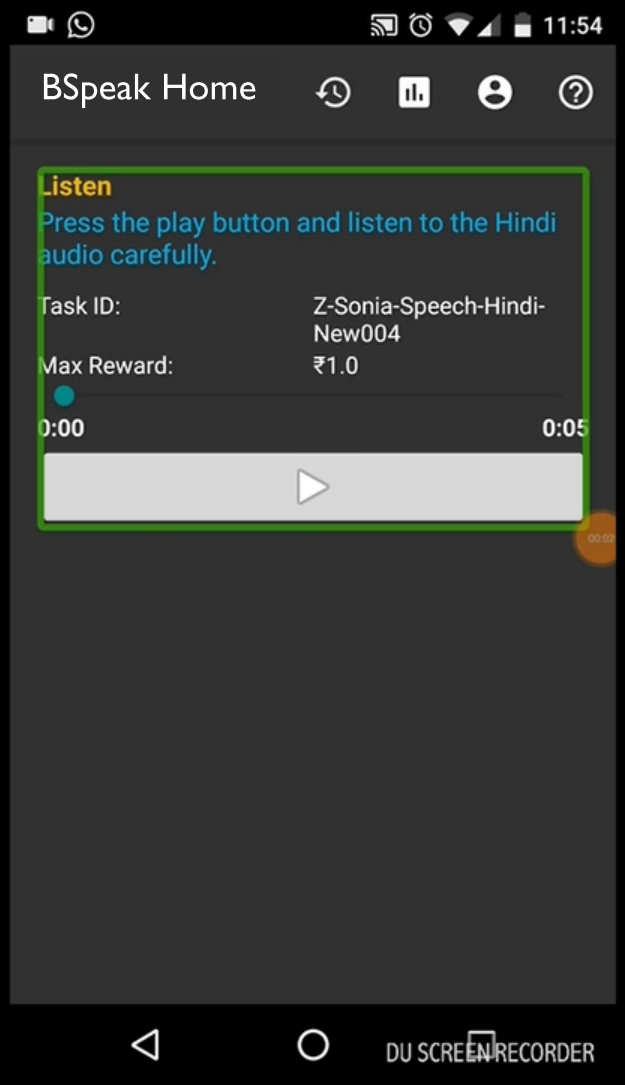


Content grouping

Explicit instructions

Large touch targets

BSpeak's Smartphone App



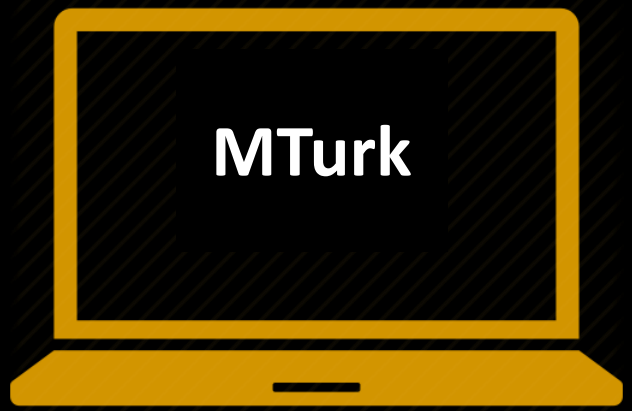
Usability Evaluation of BSpeak and MTurk

Zyskowski et al. CSCW'15

Incomplete task descriptions
Inaccessible task features
Time restrictions
Visual captchas

Clear instructions
Accessible task features
No time limits
No captchas

Usability Evaluation of BSpeak and MTurk



15 low-income blind participants
With-in subject design
Four speech transcription & information retrieval tasks

Measured task completion, time taken, accessibility score, usability scores
Conducted semi-structured interviews

Usability Evaluation Findings

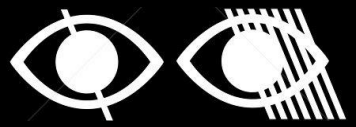
BSpeak had significantly higher task completion rate, accessibility, performance and significantly lower completion time, mental demand, effort, and frustration

Voice-based implementation

"UI elements are not labeled. Navigational and content regions are also not specified. Headings are not structured. <h1>, <h2>, <h3> should be there, but it starts with <h6>! Blind people will get confused and say, 'what is this?' I don't think blind people will be able to do work on MTurk. Somehow, I did, but I am not satisfied."

Two-Week Field Deployment in Bangalore, India

19 male, 5 female



18 blind, 6 partially sighted

50% employed

50% had family in rural areas living in poverty

All had smartphones with the Internet

14 English and 13 Hindi audio files

Interviews, songs, news, speeches, TED talks, phone calls

2.75 hours

2,560 micro-tasks

Reward amount: 60 paisa to 1.2 INR per micro-task

Deployment Results

24 users completed 16,000 micro-tasks to earn INR 7,310 ($110)

Avg. ASR accuracy
62%

Transcription accuracy
(after using MSA)
English: 87%
Hindi: 92%

Transcription cost
$1.20 per minute

User earnings
INR 36 per hour
Average: INR 300
Maximum: INR 1050

Compared to sighted Respeak users, blind BSpeak users..

completed **3x** more tasks

spent **5x** more time

earned **2.5x** more money

in **0.5x** duration

with **10%** less accuracy

Lower education (p=.002)
Lower socioeconomic status
Lower self-reported language skills

Financial and Instrumental Benefits

"I am grateful to you for creating the app. I earned money for the first time and learned the value of each rupee."

"BSpeak app has become a super hit among our trainees and staff. Most people we have asked love it and also have been making a lot of money through the tasks. We request you to send us a statement that you chose people for deployment based on your criteria, and that the organization has shown no favoritism in this."

"tool for speech therapy" "improves listening skills" "knowledge of current affairs and new subjects"

Next Steps: Improve Users' Payout

Improving task completion accuracy => higher reward per task

Reduce the playback speed of talkback software or send repeated reminders to the users

Decreasing task completion time => more tasks done in a given time

Skip tasks after pre-defined unsuccessful trials

Raising the rewards offered for completing tasks

BSpeak's transcription cost is one-fourth of the industry standard

Conclusion

Designed and built Respeak and BSpeak—an accessible, voice-based, phone-based crowdsourcing marketplace for transcribing speech in local languages & accents

Cognitive evaluations to refine key aspects of its design

Usability and accessibility evaluation of MTurk and BSpeak for speech transcription tasks

Conducted a field deployment of BSpeak in India where low-income blind people produced Hindi and Indian English speech transcription

- At one-fourth of the cost and with 90% accuracy
- In one hour, blind people earned 1x and sighted people earned 2x of the average Indian hourly wage rate
- Blind users used the app more enthusiastically than the sighted users

"You Can Always Do Better!"
The Impact of Social Proof on Participant Response Bias

Aditya Vashistha, Fabian Okeke, Richard Anderson, and Nicola Dell

PAUL G. ALLEN SCHOOL
OF COMPUTER SCIENCE & ENGINEERING

DESIGN USE BUILD

CORNELL TECH

Participant Response Bias

Extent to which participants provide researchers with feedback or results that will please the researchers or help to achieve the perceived research goals

Participant Response Bias in HCI4D contexts

"Yours is Better!" Participant Response Bias in HCI by Dell et al. at CHI 2012

Video Player 1

Video Player 2
Designed by researchers

2.5x local researcher
5x foreign researcher

Anokwa et al.
ITID 2009

Ho et al.
ITID 2009

Ledlie
Qual Meets Quant 2010

Brown et al.
CHI 2005

Social Proof

Psychological phenomenon where people assume the actions of others in an attempt to reflect correct behavior in a given situation.

Research Goal

Examine how social proof could influence response bias and encourage participants to provide critical and constructive feedback

RQ1: How does social proof impact participants' quantitative ratings of an intervention?

RQ2: How does social proof impact participants' qualitative feedback on an intervention?

Projecting Health

Production

Dissemination

110 videos

180 villages

190,000 people

"It is almost impossible to get constructive feedback. They [people in rural areas] always say the video is very nice and there is no need of improvement."

How social proof could be used to gather constructive and critical quantitative and qualitative feedback on Projecting Health videos

Intervention Design

Positive social proof

Negative social proof

No social proof (baseline)

No review

1. Subtly view reviews from other people like them on a 3-minute Projecting Health video

2. Watch the video

3. Give quantitative ratings and unstructured qualitative feedback

Intervention Design

Authoring comparable reviews: Co-design with the Projecting Health team

Measuring effectiveness of reviews: Experiments to ensure quality and effectiveness

Generalizability: MTurk study & Field study

MTurk Study Setup

Step 1: Showing the reviews subtly by people like them

Positive social proof

N=77

Negative social proof

N=78

No social proof

N=63

Please wait, your video is loading.

While you are waiting, you can read the reviews written by MTurk workers like you on this video

"Fantastic video. This video is quite exciting and informative. I would like to watch videos like this again."

27%

"Terrible video. This video made me fall asleep it was so boring. I don't want to watch videos like this again."

27%

27%

MTurk Study Setup

Step 2: Showing the video

Positive social proof

N=77

Negative social proof

N=78

No social proof

N=63

Please carefully watch the below video. The video is roughly three minutes in length. After watching the video, please tell us how did you find it.

MTurk Study Setup

Step 3: Collecting feedback

Likert scale ratings on five-point scale

Likeability	how much they liked or disliked the video
Usefulness	how useful the video was
Entertainment value	how entertaining the video was
Scope of improvement	how much the video could be improved

Subjective feedback

MTurk Study Results

RQ1: Impact on quantitative ratings (5-point Likert scale)

Condition	Likeability (L)	Usefulness (U)	Entertainment Value (E)	Scope of Improvement (S)
Baseline (N=63)	3.7	3.8	3.4	3.1
Positive (N=77)	4.1	3.9	3.6	2.9
Negative (N=78)	3.2	3.2	2.8	3.7

Condition	Baseline	Negative			
Positive	L*	L*	U*	E*	S*
Baseline		L*	U*	E*	S*

* is $p < .05$

MTurk Study Results

RQ2: Impact on qualitative feedback

Condition	Total Comments
Baseline	40
Positive	53
Negative	59

MTurk Study Results

RQ2: Impact on qualitative feedback

Condition	Total Comments	Positive Feedback	Mixed Feedback	Negative Feedback
Baseline	40	65%	25%	10%
Positive	53	68%	24%	8%
Negative	59	29%	41%	30%

MTurk Study Results

RQ2: Impact on qualitative feedback

Condition	Total Comments	Positive Feedback	Mixed Feedback	Negative Feedback
Baseline	40	65%	25%	10%
Positive	53	68%	24%	8%
Negative	59	29%	41%	30%

Useful and informative (N=82)
Realistic setting (N=7)
Actors (N=5)

Improve acting (N=48)
Improve story (N=24)
Increase entertainment (N=16)
Improve graphics and demo (N=8)

MTurk Study Results

RQ2: Impact on qualitative feedback

Condition	Total Comments	Positive Feedback	Mixed Feedback	Negative Feedback	Substantive Feedback
Baseline	40	65%	25%	10%	68%
Positive	53	68%	24%	8%	74%
Negative	59	29%	41%	30%	85%

Non-substantive feedback: "I liked the video."

Substantive feedback: "I liked that the video informed us about how the area surrounding a well should be kept clean. I wish you could show some examples of clean areas."

Field Study Setup

Waiting area

Participants waited for their turn here. They went to staging area when called.

Staging area

Participants came to this area one by one. Social proofing reviews were then shared.

Study area

Participant watched the video alone and verbally answered survey questions.

Social Proofing Participants

First confederate

Second confederate

Participant

Social Proofing Participants

What are you reading?

First confederate

Yesterday we went to the neighboring village where the researcher showed the Projecting Health video. He asked women for their feedback on the video and noted it down. I was just reading the feedback women gave to him. See, this women told him [reads first review]

Second confederate

Social Proofing Participants

Hmm . . . Okay . . .
[appreciating nod]

First confederate

Yes, another woman told
[confederate reads the second review]

Second confederate

Social Proofing Participants

[Second confederate turns to the participant]
Such detailed feedback is very important to improve the project. You should give your feedback without any hesitation like these women in the neighboring village did.

Second confederate

Field Study Participants

63 low-income, low-literate women

32 years old on average

5.7 years of formal education

Monthly family income of USD 106

Field Study Results

RQ1: Impact on quantitative ratings (5-point Likert scale)

Condition	Likeability (L)		Scope of Improvement (S)	
Baseline	4.3	**3.7 (MTurk)**	1.8	**3.1 (MTurk)**
Positive	4.6		1.3	
Negative	3.1		2.3	

Condition	Baseline	Negative
Positive	L*	L* S*
Baseline		L*

* is p <.05

Field Study Results

RQ2: Impact on qualitative feedback

Condition	Positive Feedback	Mixed Feedback	Negative Feedback
Baseline	21	1	0
Positive	17	3	0
Negative	7	11	3

Field Study Results

RQ2: Impact on qualitative feedback

Condition	Positive Feedback	Mixed Feedback	Negative Feedback	Substantive Feedback
Baseline	21	1	0	13
Positive	17	3	0	19
Negative	7	11	3	20

Field Study Results

Received feedback different than the seeded social proof reviews

- Detailed suggestions on video attributes they heard in the social proof reviews
- New topics for future videos
- New suggestions to improve the video

"I liked that information about diseases was given. I learned that we should use borewells that are dug deeper. You should also add songs. You should also share precautions to take with tap water."

Conclusion

To influence participant response bias and receive constructive feedback, we designed a social proof based intervention that is low-cost, practical, and generalizable

Situated our research in a real-world intervention—Projecting Health impacting over 190,000 rural residents in India

Conducted an online study with 218 MTurk workers and a field study with 63 low-income women

- Participants exposed to negative social proof provided lower ratings and a greater amount of critical feedback

Mechanism Design for Social Good

Agriculture: designing better markets

Digital financial services: designing better incentives

Crowdsourcing marketplaces: optimizing gains for both task requestors and task workers

Health: Optimizing routes for time-sensitive vaccine delivery

Thank you!

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