Introduction to ICT4D

Paul Spiesberger & Anne Muchiri

Information and Communication Technologies for Development

ICT4D.at
Austrian Network for Information and Communication Technologies for Development

ROTA
rota.inso-world.com

Teach CSE in India

Teach Computer Science in India

IAESTE internship, work as a CSE professor in rural India and teach programming

Loose engagement, own ideas are welcomed and have an incredible experience

ICT4D.at contest 2025

Opening Opportunities: Digital Tech for All!

This contest is looking for **feasible ideas from all over the world** on *how digital tools can empower marginalized people, foster equal opportunities and serve everyone.*

https://www.ideaspace.cc/en/opening-opportunities/

SUBMISSION PHASE	COMMUNITY VOTING	JURY VOTING	WINNER ANNOUNCEMENT
10. Nov – 7. Jan	8. Jan – 18. Jan	9. Jan – 30. Jan	Beginning of February

Prizes

- First Place: 500 Euro
- Second Place: 300 Euro
- Third Place: 200 Euro

In addition:

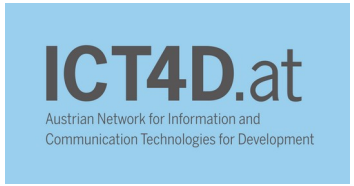
🚀 Up to € 5,000 project funding from ICT4D.at to implement your idea

💡 Mentorship Program (February–March 2026, optional)

🔧 Participation in the ICT4D.at Project Forge 2026 (online, February 2026, optional)

Paul Spiesberger

- Chair of the Austrian Network for Information and Communication Technologies for Development (ICT4D.at)
- Affiliated Member of the ICT4D Collective
- Operative Head of ROTA research group at INSO, Vienna University of Technology
- Implementing, advising and overseeing ICT4D projects since more than 10 years
- Senior software developer for native Android and iOS mobile applications



Facts and Figures

- Six of the world's seven billion people have mobile phones - but only 4.5 billion have a toilet (UN **2013**)
- Almost everyone lives in the range of a mobile-cellular tower (Brahima, **2018**)
- 60% of world population is now online, with the average user spending over 40% of their waking life on the Internet (Istrate, **2024**)

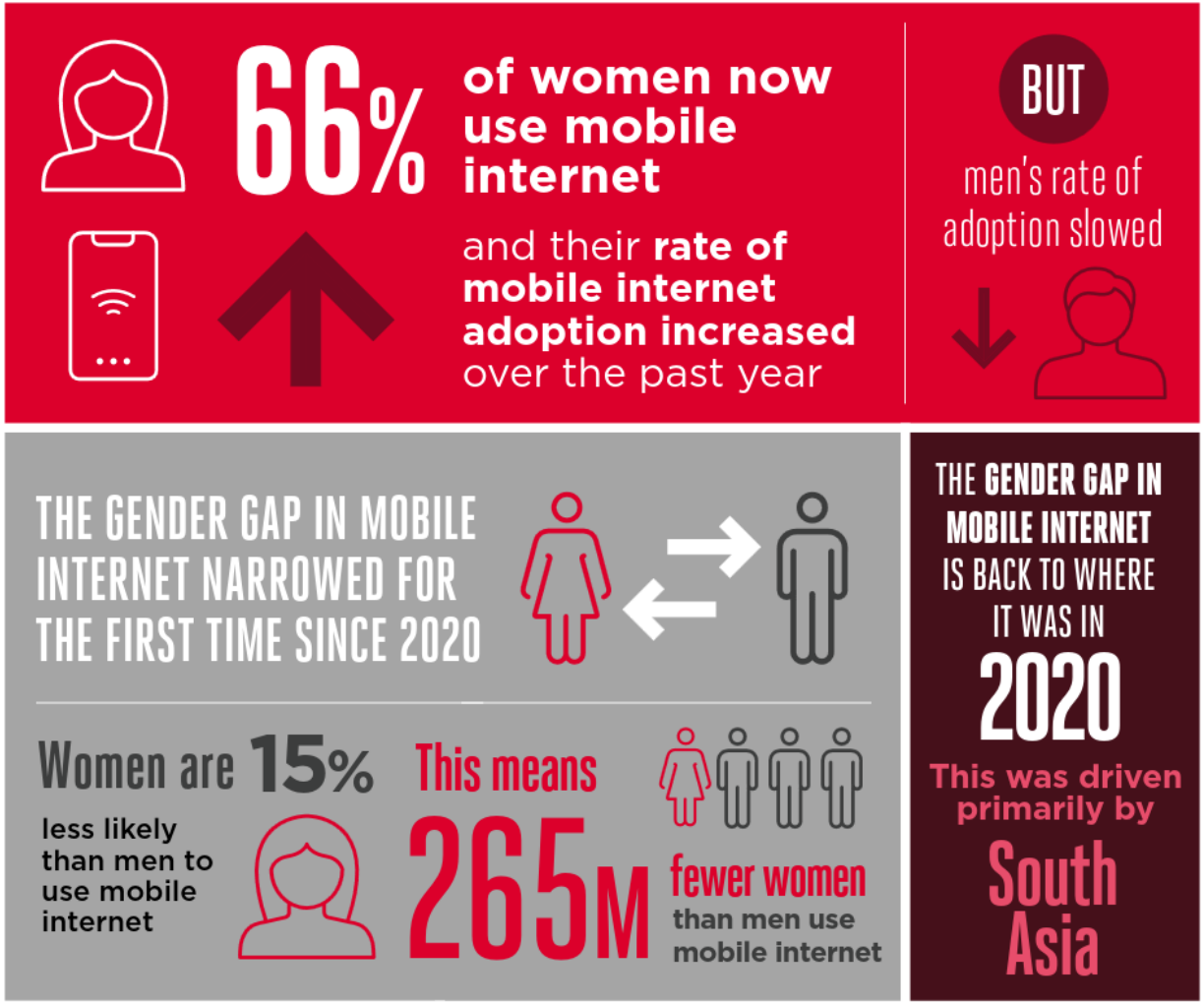
Never in the history of mankind were so many people theoretically connected on this planet

Regional Share of Global Internet Users 2001-2018

Region	Percent (%) share in 2001	Percent (%) share in 2018
Rising share		
Africa	1	11
Middle East	1	4
Latin America/Caribbean	5	10
Asia	32	49
Falling Share		
North America	30	8
Oceania	2	1
Europe	29	17

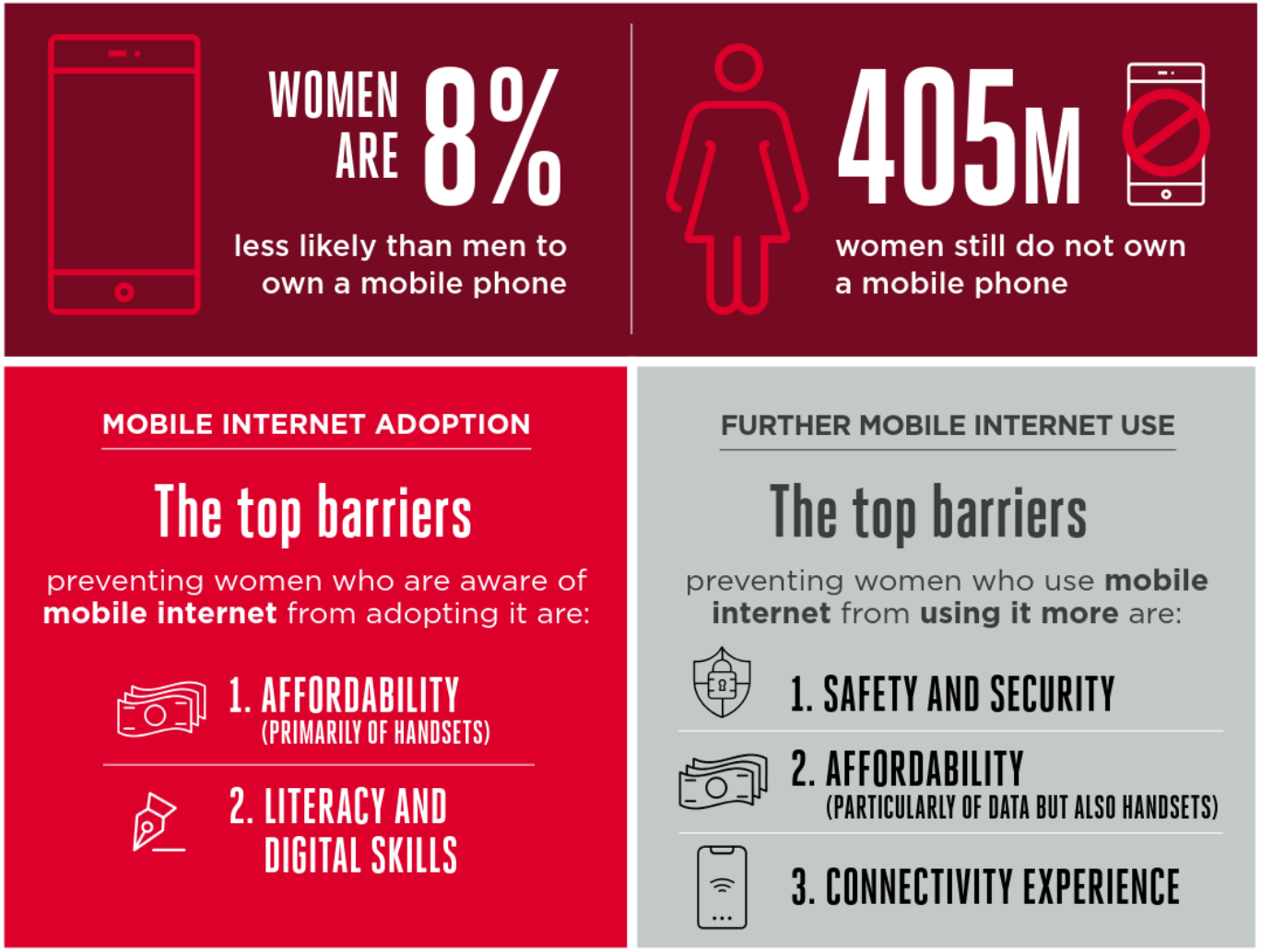
Heeks (2020)

In Low- and Middle-Income countries:



GSMA – The Mobile Gender Gap Report 2024

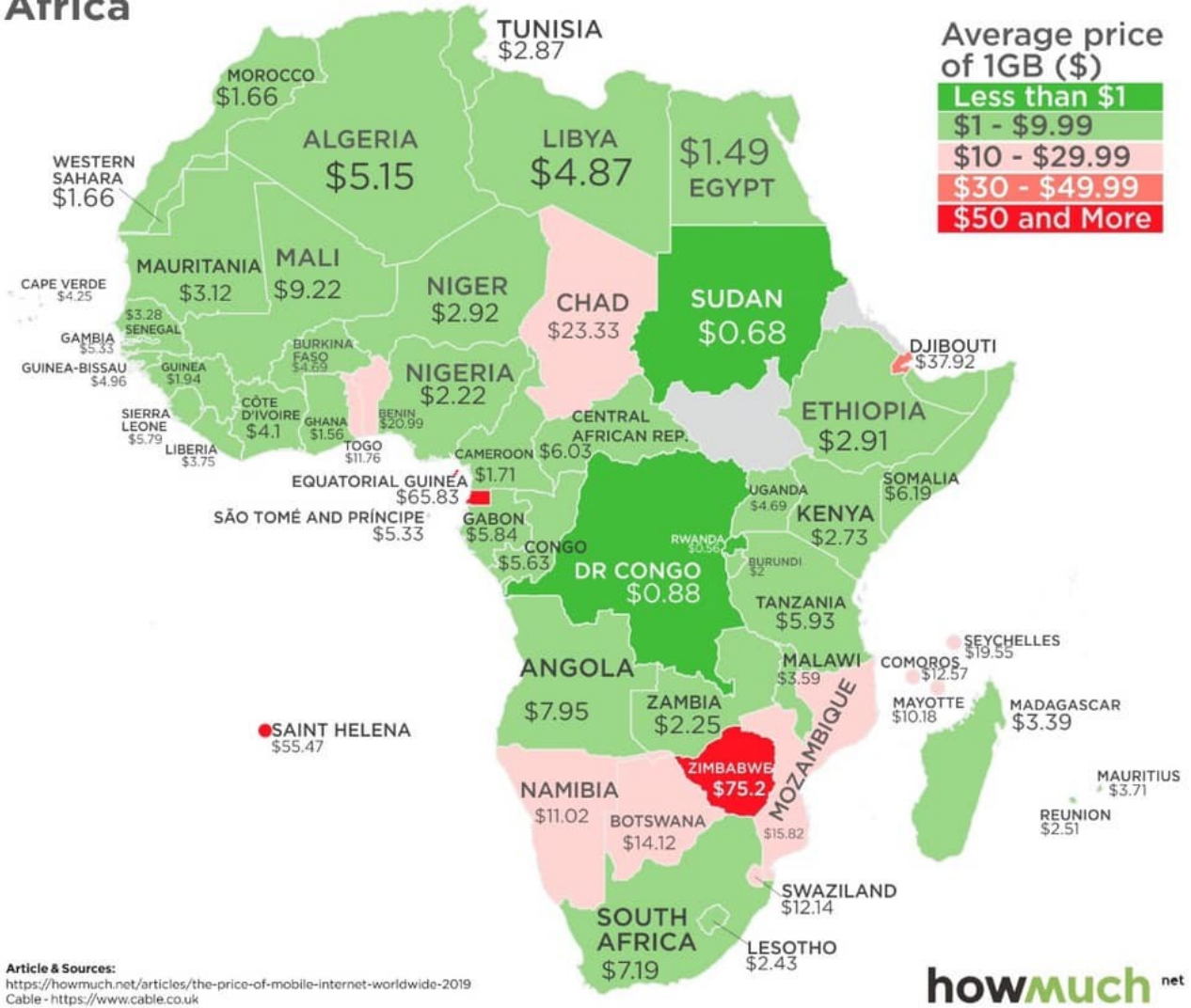
In Low- and Middle-Income countries:



GSMA – The Mobile Gender Gap Report 2024

The Price of Mobile Internet 2019

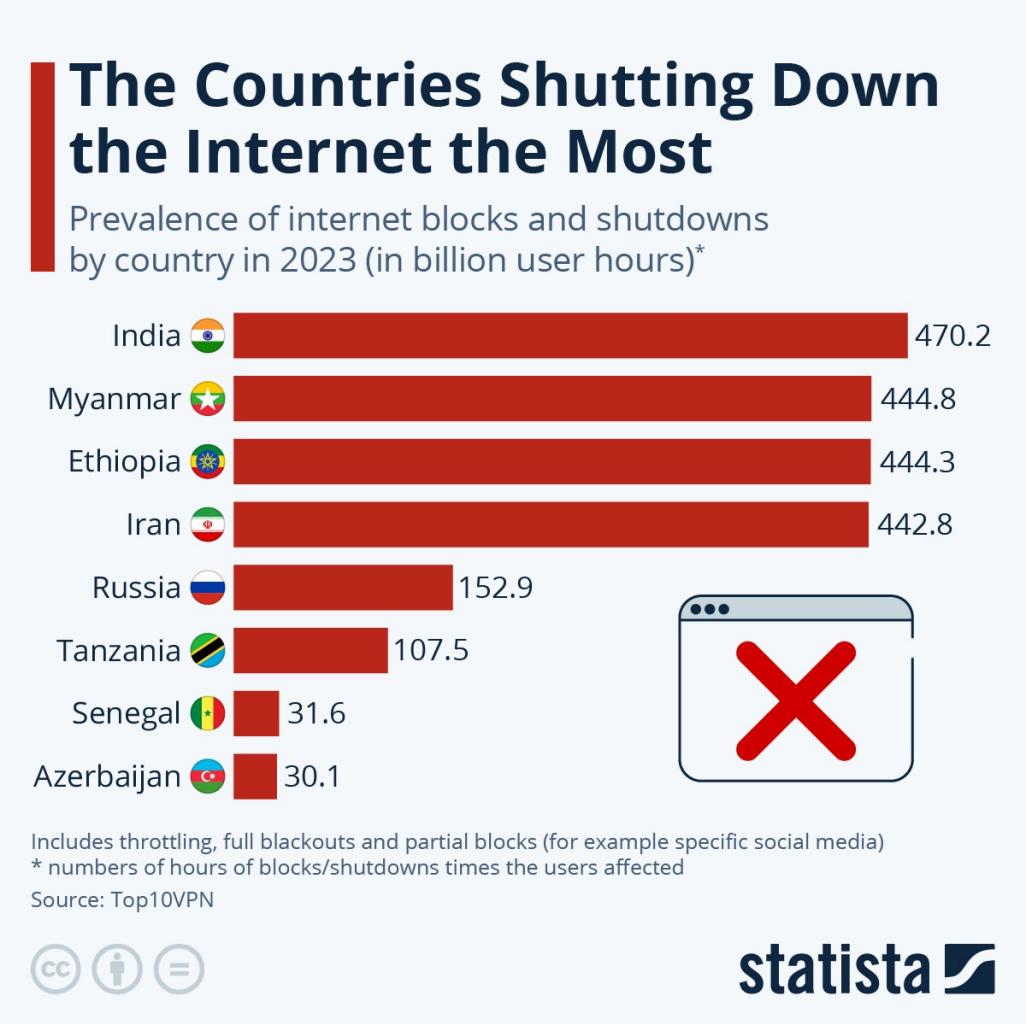
Africa

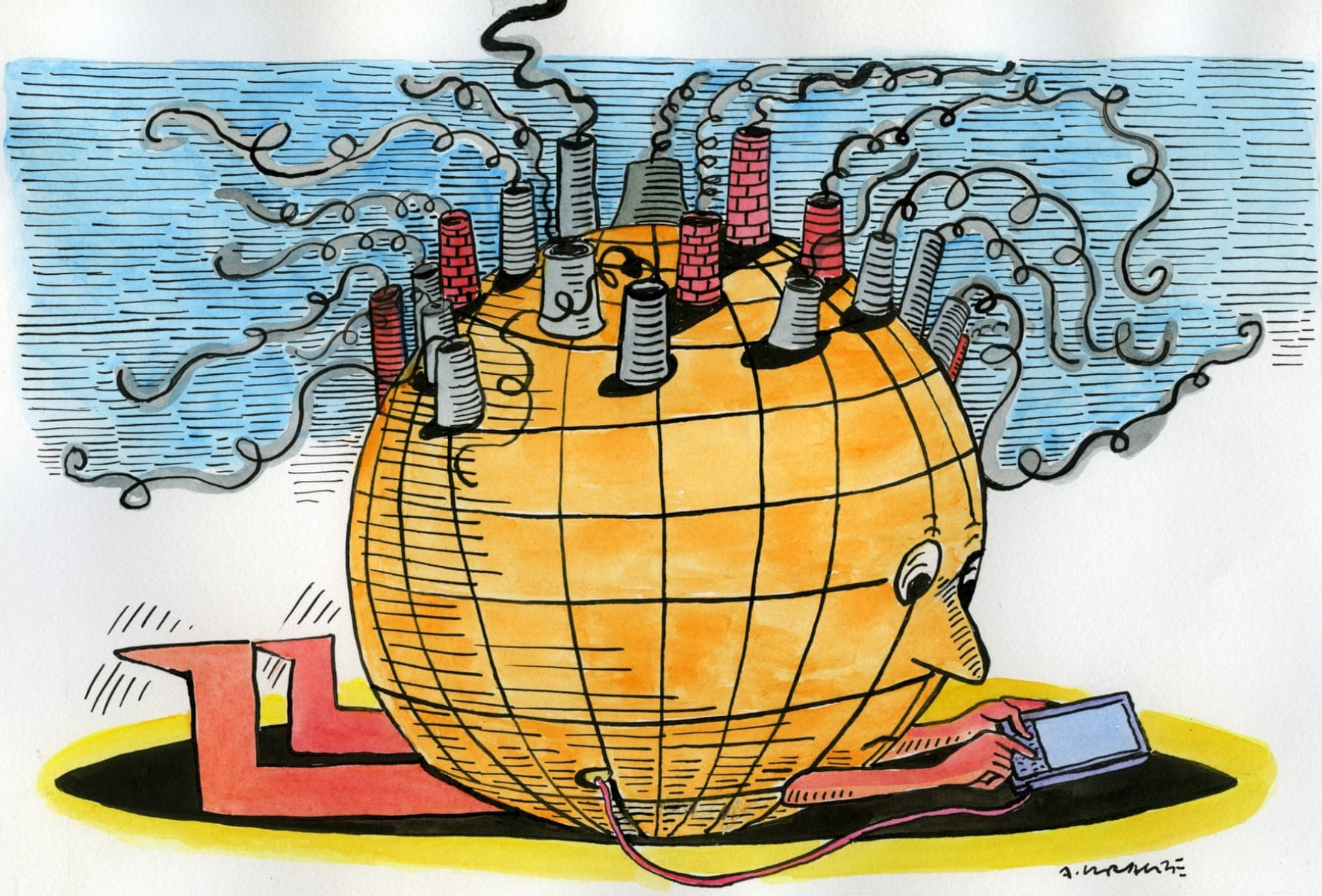


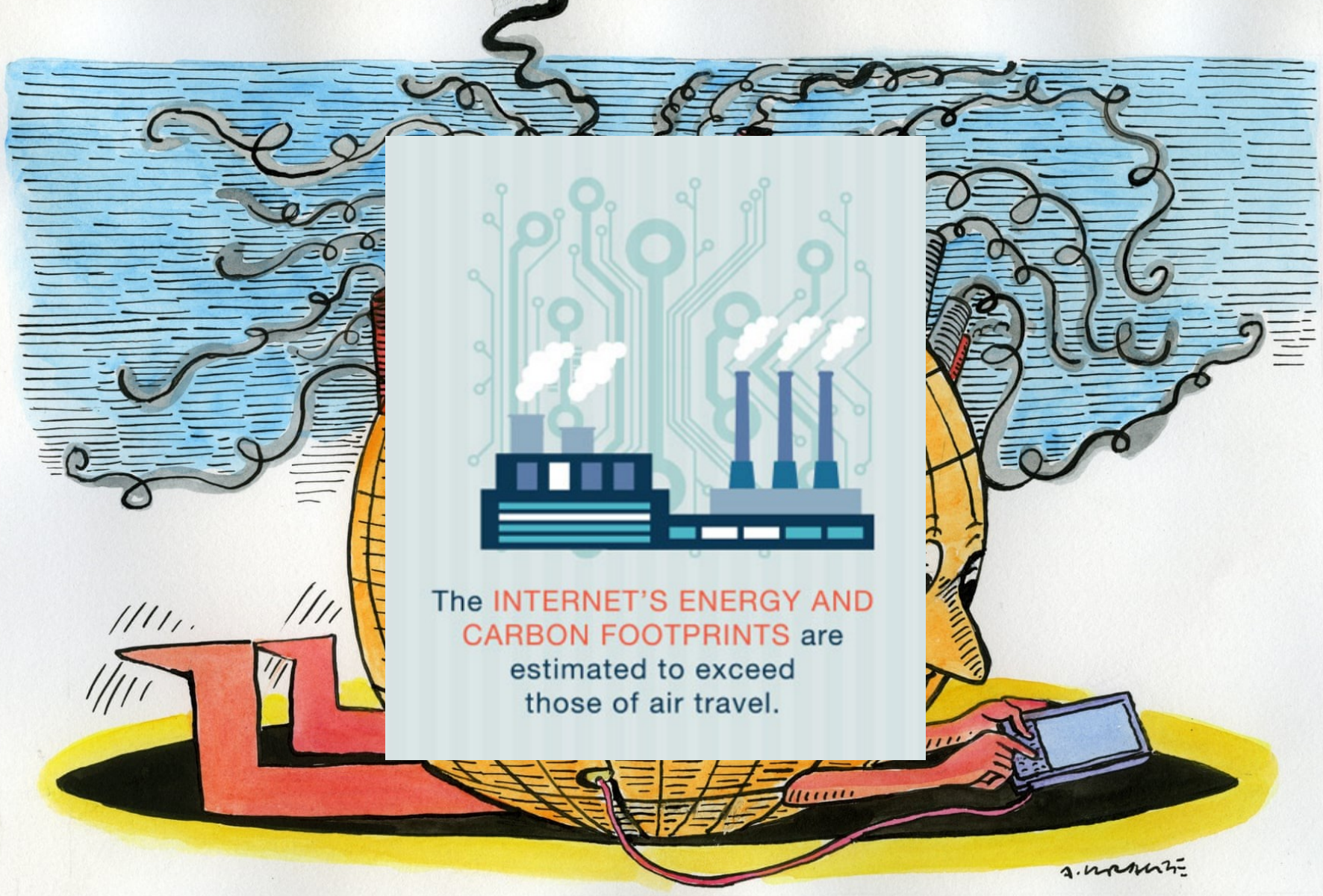
Article & Sources:
https://howmuch.net/articles/the-price-of-mobile-internet-worldwide-2019
Cable - https://www.cable.co.uk

howmuch.net

Privacy and Freedom of the Internet






The INTERNET'S ENERGY AND CARBON FOOTPRINTS are estimated to exceed those of air travel.

ICT4D

Overview

Information and Communication Technologies for Development

ICT...

Information and Communication Technologies

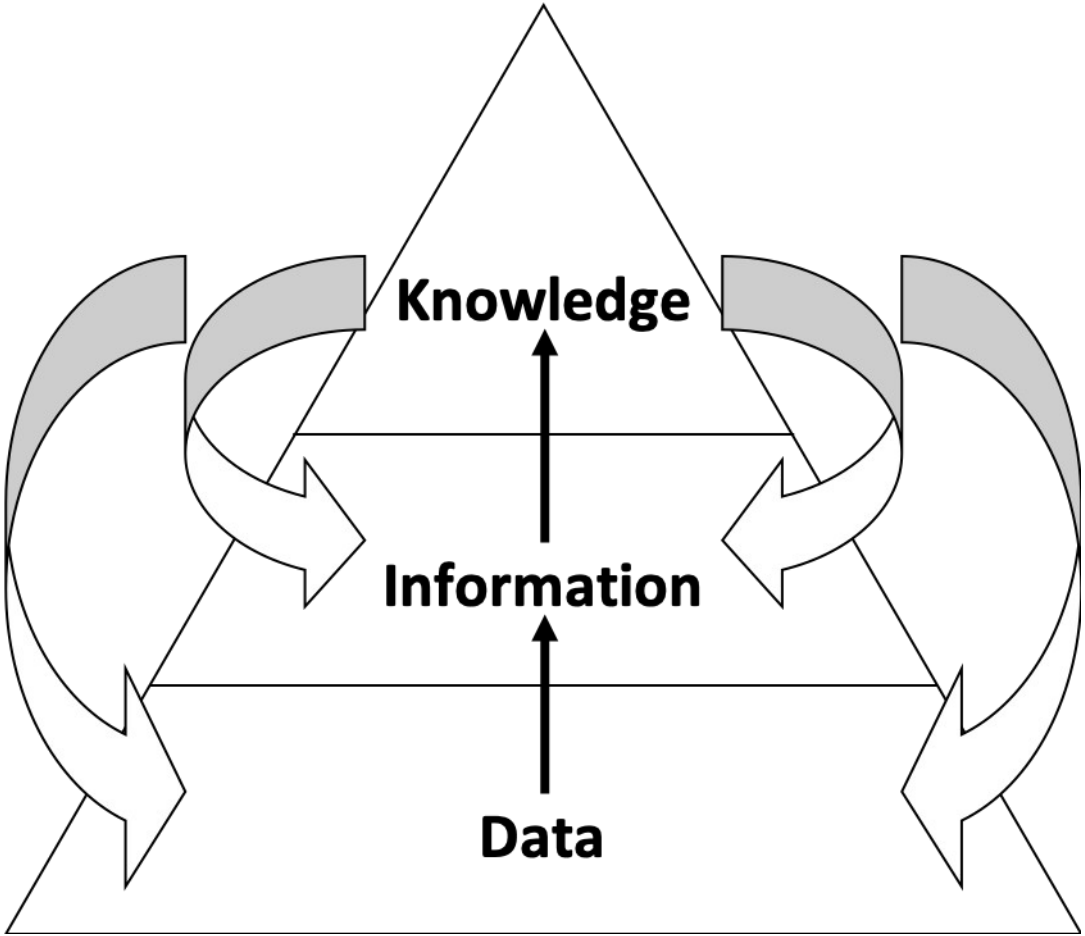
...4D

for Development

Information and **Communication Technologies**

ICT stresses the role of unified communications and the integration of telecommunications & computers which enable users to **access**, **store**, **transmit**, and **manipulate information**.

Defining Information



Heeks (2018)

Defining Technology

Technology: devices or techniques that apply knowledge in order to complete a particular task.

Defining Information and Communication Technology (ICTs)

ICT: digital devices or techniques that apply knowledge in order to process or communicate data

...4D
for Development?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NETWORK
AMERICAN
EXPRESS

Defining Development in the field of ICT4D

for Development

Empower people and communities with ICTs.

Defining Development

Development: **particular progressive change** in a **developing country**

ICT4D 2.0

1) Readiness – Infrastructure
2) Availability – Rolling out
3) **Uptake - make it useful**
4) **Impact - greatest developmental impact**

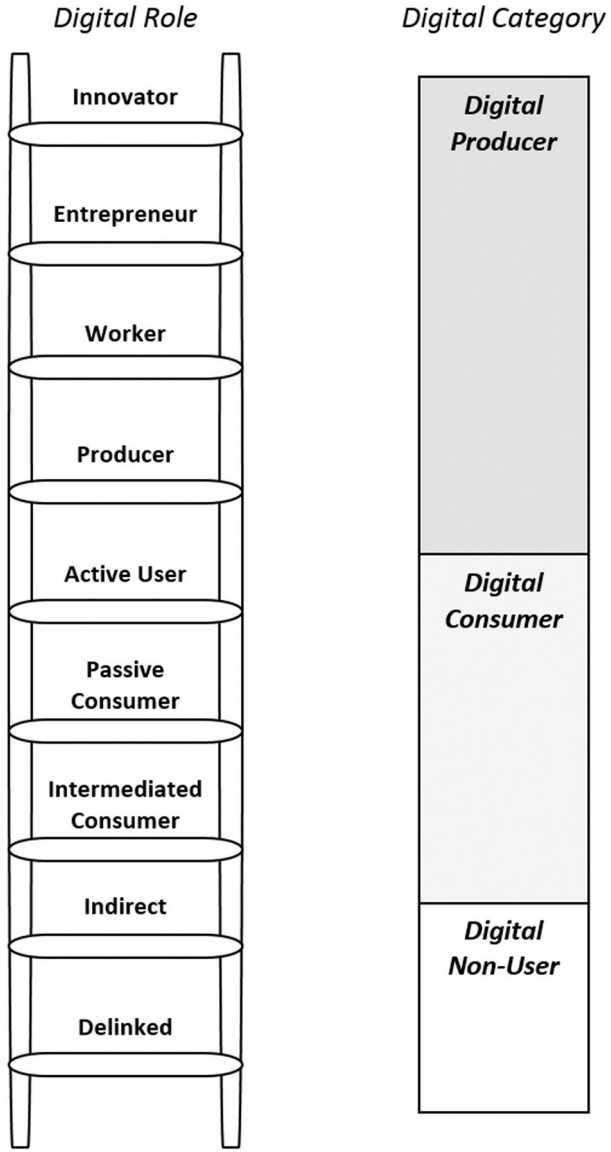
ICT4D 2.0 puts the poor in the centre and is demand driven

Heeks (2008, 2018)

ICT4D 2.0

One problem has been that many projects and policies stuck in an ICT4D 1.0 mindset:

Focused on developing digital consumer **not digital producer roles**. There needs to be a greater recognition that digital producer capabilities are a foundation for future ICT4D.

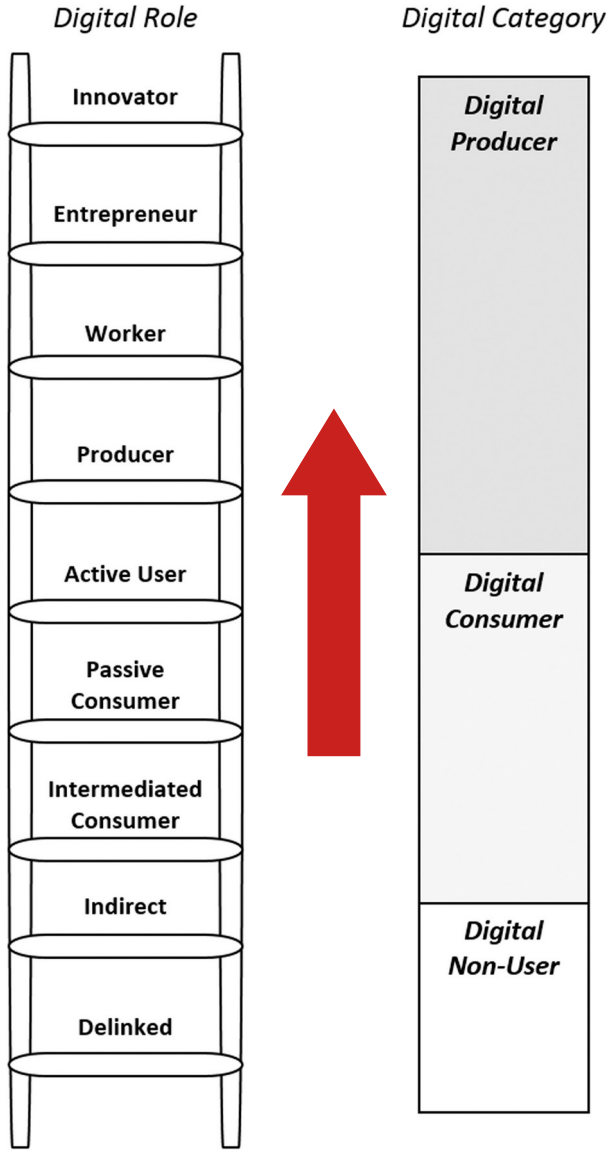


Heeks (2018), Heeks, R. (2020)

ICT4D 3.0?

Proposes a shift from **ICTs** for Development to **Digital** for Development

More and **more people** from developing countries climb up the ladder and become **Digital Producers**



Heeks, R. (2020_1, 2020_2)

Technology is **not neutral**

Technology always **serves a purpose**

Technology is always created by **an entity with an agenda**

ICT4D - And what is meant by development?

ICTs have the potential either to increase inequalities or to reduce them.

Development is usually understood to involve concepts of **progression** and **growth**.

Unwin (2009)

ICT4D therefore has a profoundly moral agenda. It is not primarily about the technologies themselves, but is instead concerned with how they can be used to enable the empowerment of poor and marginalized communities. This is a shared agenda and involves reflection on behalf of all those who aspire to make the world a fairer and better place.

Tim Unwin

ICT4D – in Practice & Theory

As opposed to classic technical science in which the main focus lies on what **is** and what **can be** achieved, ICT4D is about what **should be** done and **how** to go about doing it.

ICT4D has a profoundly **moral agenda**.

Unwin (2009)

Defining ICT4D

ICT4D: the application of any entity that processes or communicates digital data to deliver some part of the international development agenda in a developing country

ICT4D in Practice:

Digital Skilling of Older Adults

Anne Muchiri:
Researcher
ICT4D.at, KARIKA Kenya

Africa

TUNISIA
MOROCCO
ALGERIA
LIBYA
EGYPT
WESTERN SAHARA
MAURITANIA
MALI
NIGER
CHAD
SUDAN
ERITREA
DJIBOUTI
SENEGAL
THE GAMBIA
GUINEA BISSAU
GUINEA
BURKINA
BENIN
TOGO
NIGERIA
SIERRA LEONE
COTE D'IVOIRE
GHANA
LIBERIA
CAMEROON
CENTRAL AFRICAN REPUBLIC
SOUTHERN SUDAN
ETHIOPIA
SOMALIA
EQUATORIAL GUINEA
REP. OF THE CONGO
GABON
DEMOCRATIC REPUBLIC OF THE CONGO (ZAIRE)
RWANDA
BURUNDI
UGANDA
KENYA
Lake Victoria
Indian Ocean
Zanzibar
Lake Tanganyika
TANZANIA
South Atlantic Ocean
ANGOLA
MALAWI
Lake Nyasa
ANGOLA
ZAMBIA
MOZAMBIQUE
MADAGASCAR
ZIMBABWE
NAMIBIA
BOTSWANA
SWAZILAND
LESOTHO
SOUTH AFRICA
Indian Ocean
0 500 1000 Nautical Miles

Kenya
Turkana
Marsabit
Mandera
Wajir
West Pokot
Samburu
Isiolo
Trans Nzoia
Baringo
Bungoma
Uasin Gishu
Laikipia
Meru
Busia
Kakamega
Nandi
Siaya
Vihiga
Kisumu
Nakuru
Garissa
Nyandarua
Nyeri
Tharaka-Nithi
Kericho
Homa Bay
Kirinyaga
Embu
Murang'a
Kisii
Bomet
Migori
Kiambu
Narok
Nairobi
Machakos
Kitui
Tana River
Lamu
Kajiado
Makueni
Taita-Taveta
Kilifi
Kwale
Mombasa
OnTheWorldMap.com


ICT4D.at
A WORLD
OF EQUAL OPPORTUNITIES
FOR ALL

Sustainable Development Goals (SDG's)

Background

1 Digital Transformation

Rapid digitalization of services

- Government & public services (taxes, SHIF, pensions, IDs)
- Financial services (mobile money, banking, cash transfers)
- Health & wellbeing (appointments, telemedicine, insurance access)
- Social connection (video calls, WhatsApp, social media)
- Learning & skills (online courses, tutorials, hobbies)
- Shopping & daily life (groceries, medicine, bills, transport)
- Entertainment & enrichment (YouTube, news, music, games)

2 Aging Population

- Global share projected to rise significantly: **12%** in 2015 → **22%** by 2050 (WHO, 2024)
- Nearly **80%** will live in LMICs, including Kenya (WHO, 2024)
- Kenya: **6% (2.86M** of 47.6M) (KNBS, 2019)

3 Grey Digital Divide

- **Grey Digital Divide:**
  - **Digital skills gaps**
  - **limited access and affordability**
  - **lack of adaptive delivery mechanisms**

Exclusion, No Development

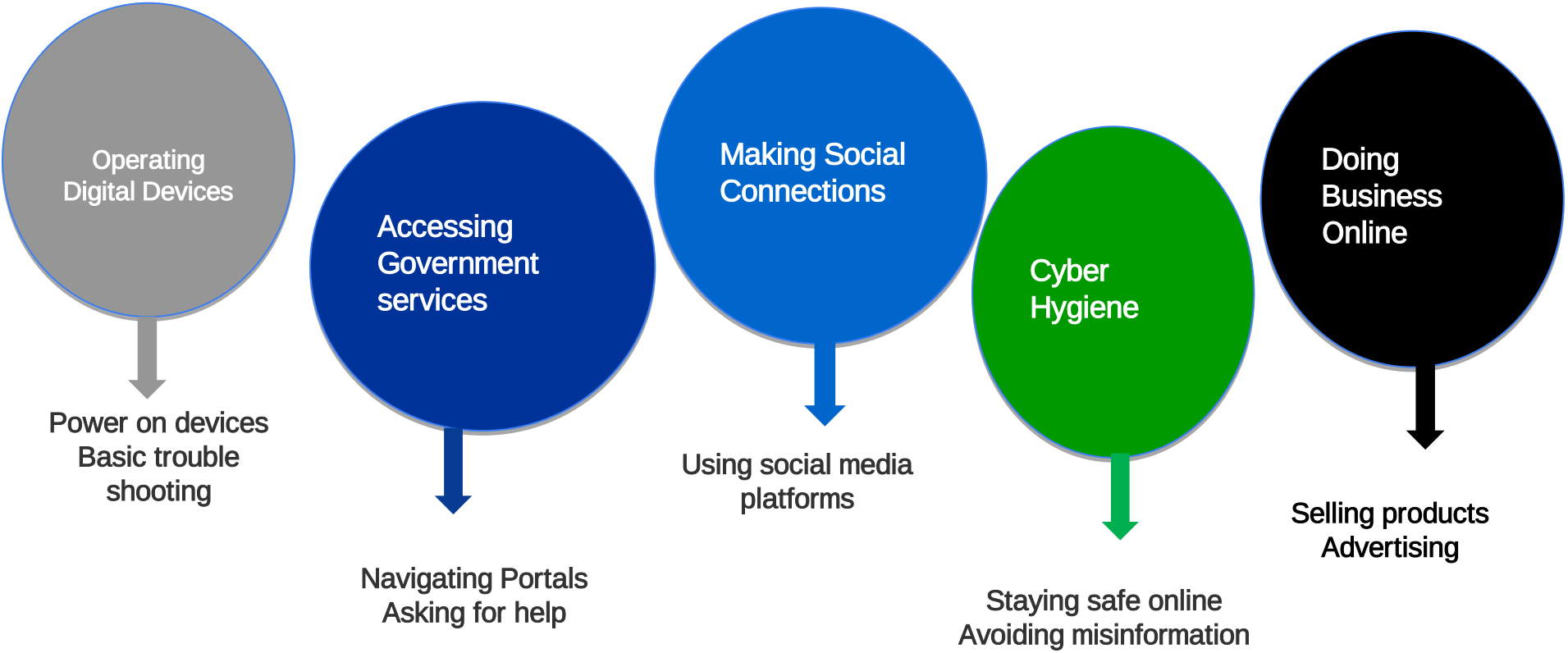
What can Seniors do Online? – Heterogenous User Group

1

2

3

Digital Skilling Project




CPF

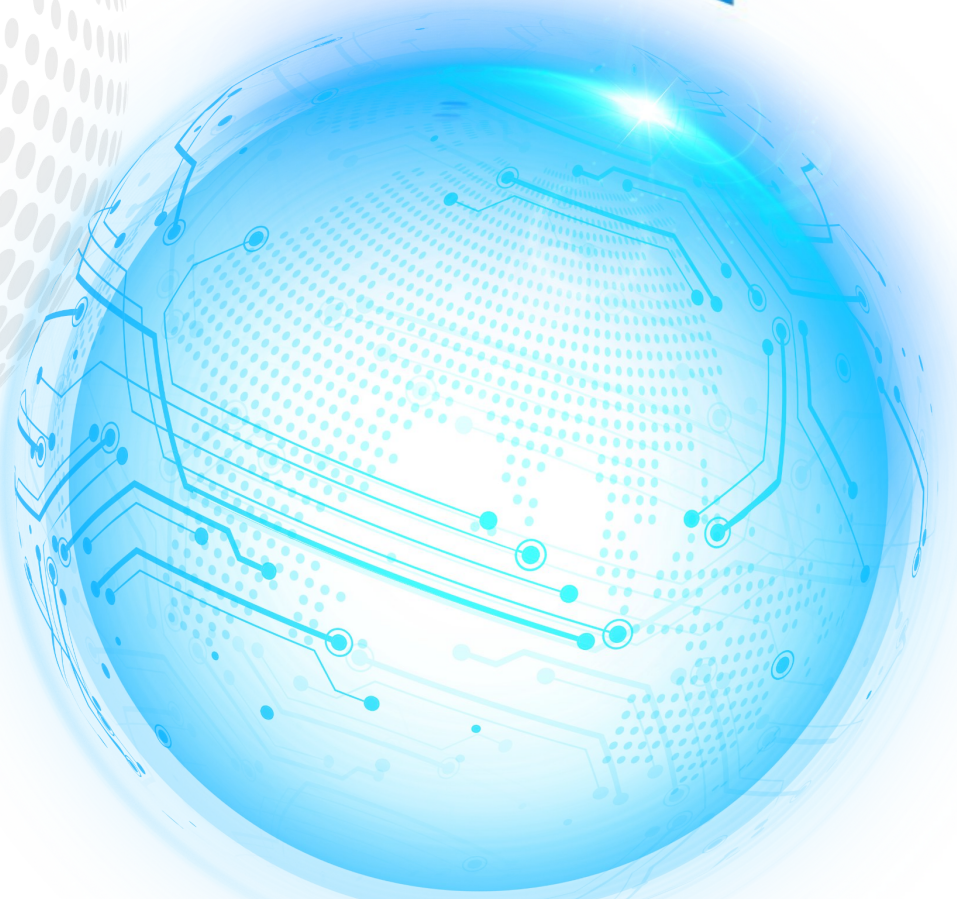
Sessions

1. Digital Inclusion of Older Adults
2. Autonomy and Independence
3. Social Connectedness
4. SDG’s

5. Add More?

THANK YOU

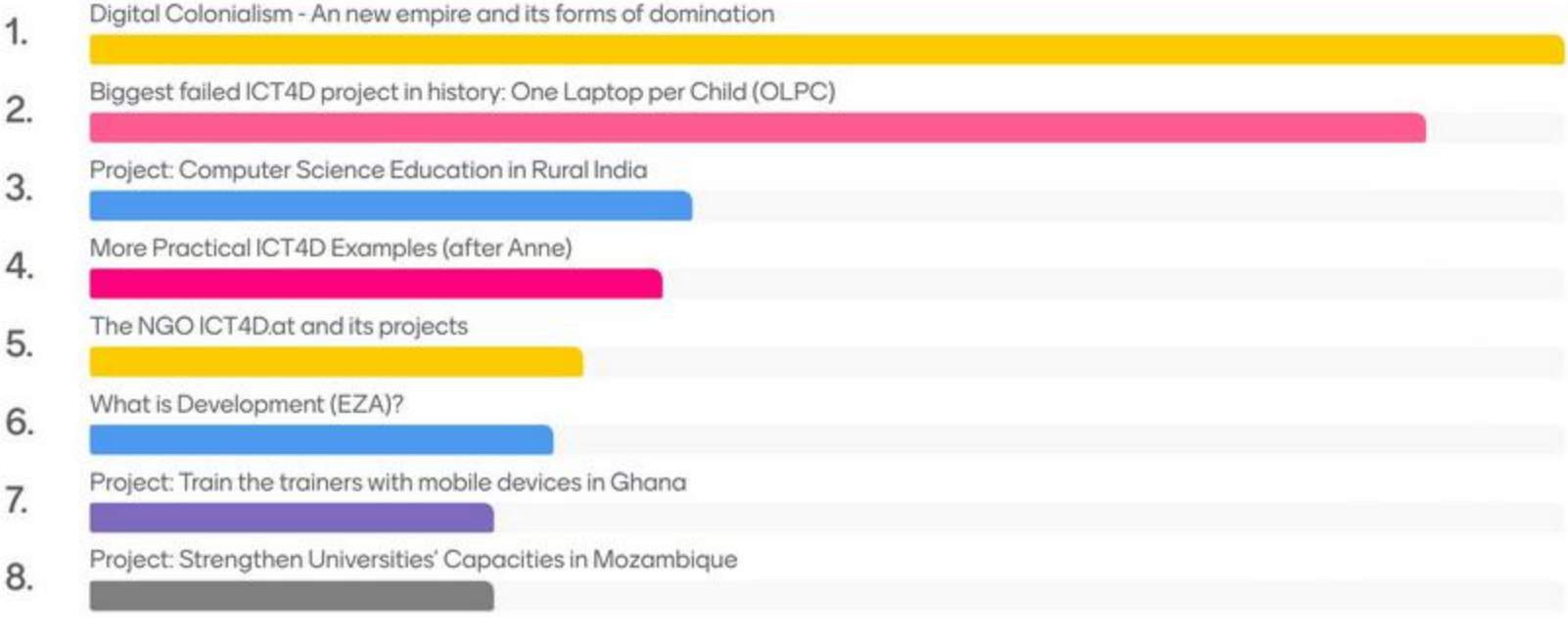
Questions?



anne.muchiri@ict4d.at

Chose your next topic

Which topics interests you the most?



Digital Colonialism

An new empire and its forms of domination

“Colonialism is the **system of domination** put in place to **serve the interests of empire** and is to be understood as the **operational dimension of imperialism**.”

Osterhammel, “Colonialism: A Theoretical Overview”, 1997

Digital colonialism is the **use of digital technology** for political, economic and social domination of another nation or territory.

Michael Kwet, "Digital colonialism – The evolution of US empire", 2021

Current Development

The USA is reinventing colonialism in the marginalized regions through the domination of digital technology. Multinationals exercise imperial control at the architecture level of the digital ecosystem:

- Software
- Hardware
- Network connectivity

Which leads to 5 forms of domination...

Michael Kwet, “Digital Colonialism: US Empire and the New Imperialism in the Global South” 2018

5 Forms of Domination

1) **Resource extraction** through surveillance, constituting a new form of economic domination.

2) Control of computer-mediated experiences, granting **direct power over political, economic, and cultural domains of life** – a new form of imperial control.

3) Violation of privacy concentrates **economic power into the hands of the empire's corporations** – a system of global surveillance capitalism.

4) The empire's intelligence agencies conduct **mass and targeted surveillance**. This intensifies imperial state surveillance.

5) Empire's elites have established to **proceed according to its own ruling class conceptions of the digital world**, setting the foundation for tech hegemony.

Michael Kwet, "Digital Colonialism: US Empire and the New Imperialism in the Global South" 2018

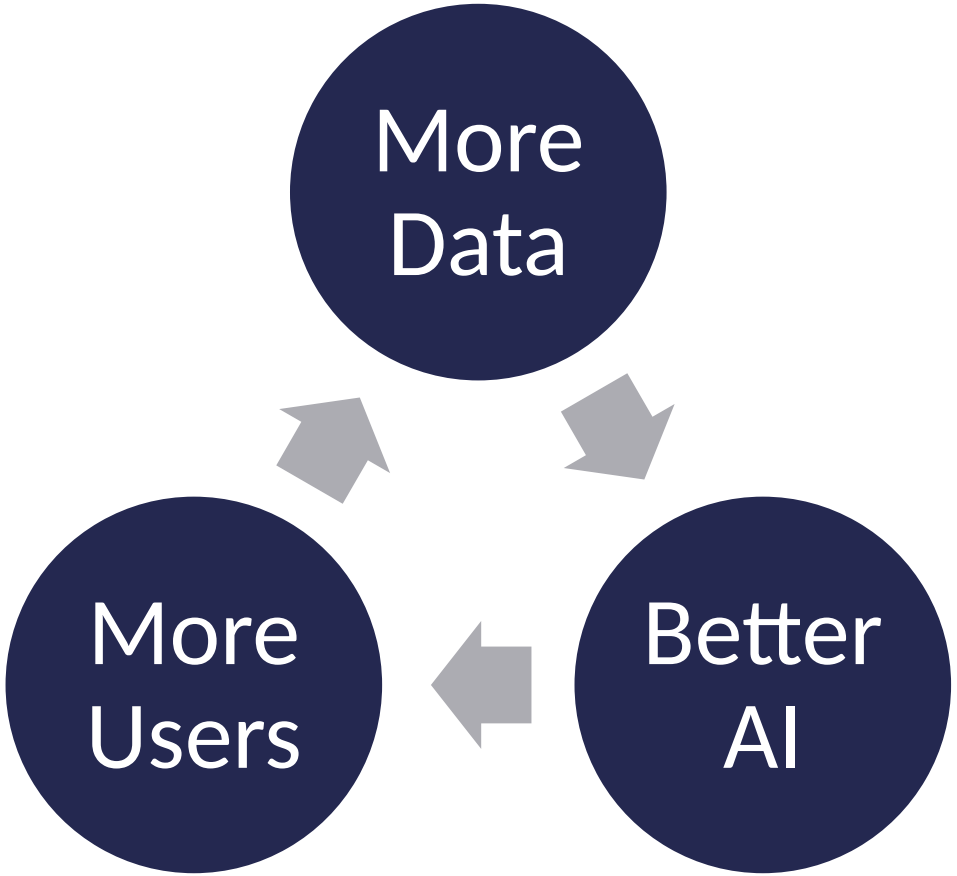
Example “free” Internet

- Facebook is basically the internet and destroys net neutrality
- Facebook is in control of communications, economy & politics
- Facebook extracts data and creates more and more services for “free”
- Countries get more and more depended on a foreign technology

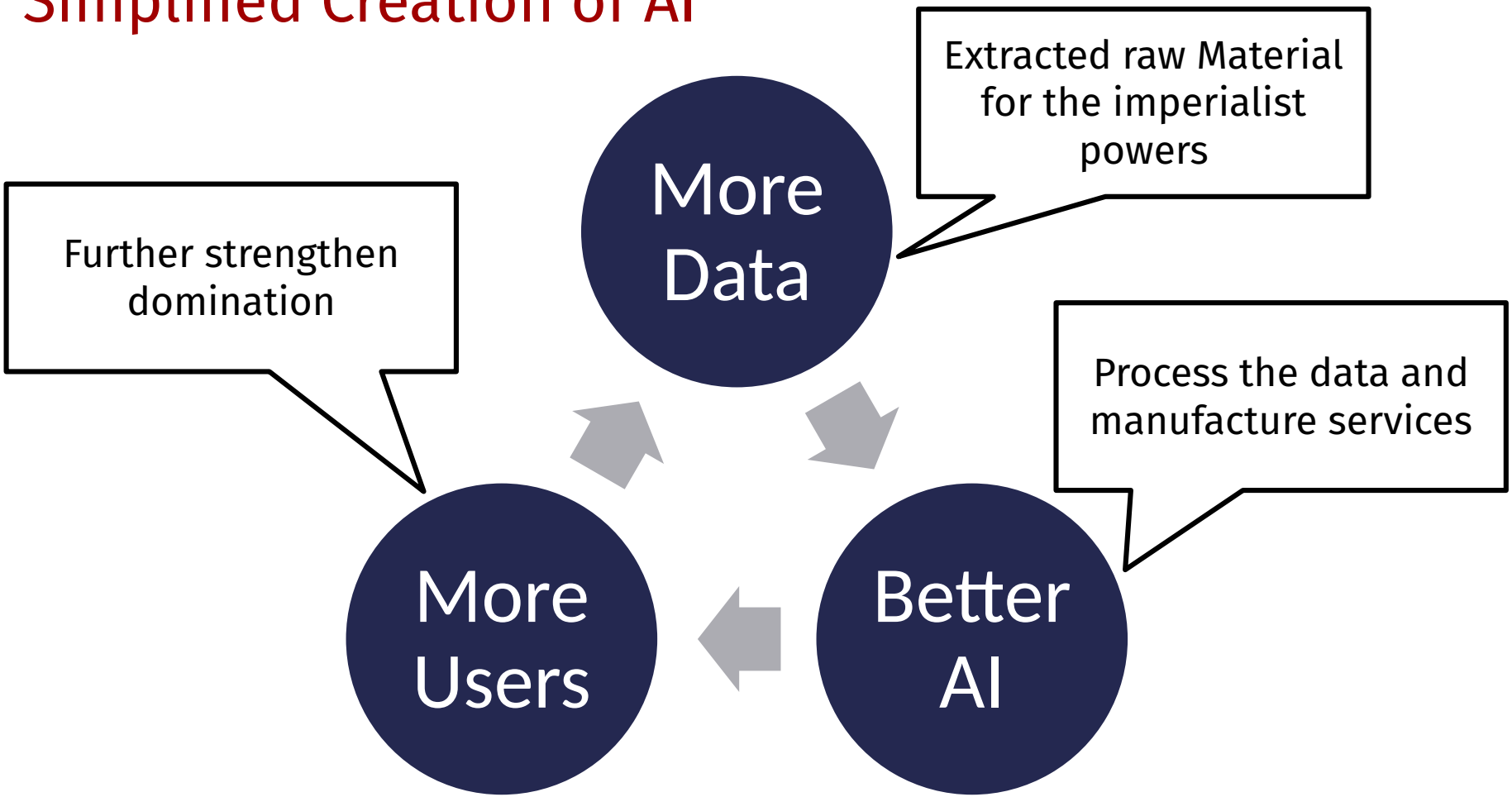
Where Facebook is free in Africa (2016)

https://www.theguardian.com/world/2016/aug/01/facebook-free-basics-internet-africa-mark-zuckerberg

Simplified Creation of AI



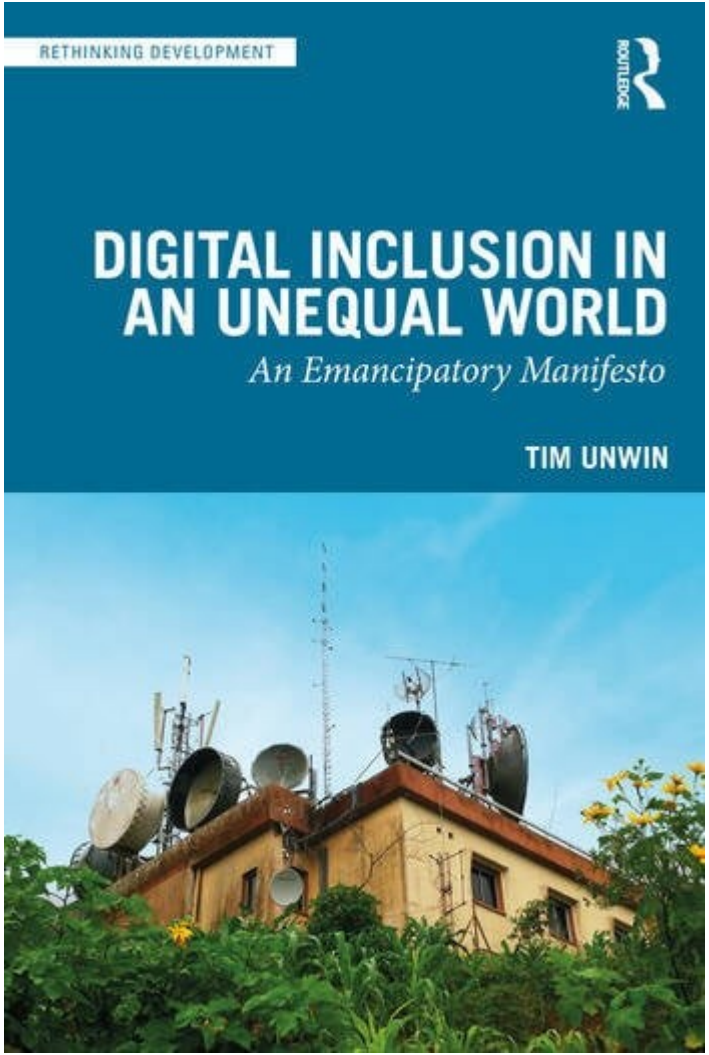
Simplified Creation of AI



Book Recommendation

Digital Inclusion in an Unequal World: An Emancipatory Manifesto by Tim Unwin

https://www.routledge.com/Digital-Inclusion-in-an-Unequal-World-An-Emancipatory-Manifesto/Unwin/p/book/9781032983042



Learning from Failures

engineers without borders
ingénieurs sans frontières
Canada

2017 FAILURE REPORT

ICT4D fail most of the time

It is estimated that **70% of ICT4D projects fail**.

Orient to Development – avoid being “techno-centric” and keep a focus on the development goal.

Design for the local context – don’t get too excited about the technology and focus more on the user (UCD).

Address potential harm – mitigate harm/risks by good design and implementation from the beginning.

Heeks (2018)

One Laptop per Child (OLPC)

One Laptop per Child (OLPC)

Source: wiki.laptop.org/go/Image:Laptop-crank.jpg

The Five Principles

Child Ownership

Low Ages

Saturation

Connectivity

Free and Open Source

Every child gets a laptop

Source: www.laptop.org

OLPC Critics From the Beginning

- I'd rather have "clean water and real schools" than laptops
- "Just another American marketing ploy."
- "the $100 gadget" -Intel
- "Geez, get a decent computer where you can actually read the text," -Bill Gates
- "We were excited about the prospects, but kind of scared by the over-simplistic plan, or lack of plan"

https://www.theverge.com/2018/4/16/17233946/olpcs-100-laptop-education-where-is-it-now

OLPC Numbers

- ~2.8 million OLPC laptops delivered
- Projects in 40+ countries
- Uruguay as the only country to reach “one laptop per child” (400,000 laptops)
- 2009 TechCrunch named OLPC’s laptop one of the biggest product flops of the decade.
- 2012 OLPC solar-powered Android tablet which never got implemented.
- 2014 - the Boston-based OLPC Foundation quietly disbanded, and OLPC News shut down.

OLPC in Uruguay

Source: www.flickr.com/photos/dcmetroblogger/

OLPC Implementation

- Could not deliver the $100 - costs doubled to ~$200
- Promised features were not implemented (e.g. hand crank or Wifi-Mesh)
- Sugar (Linux OS) “wasn’t MS Windows”
- “Can we build the laptop in our country?” - Head of States
- Sudden competition by Intel or Eee PC (“netbook”)
- FOSS community separated over MS cooperation

OLPC Fails

Fails

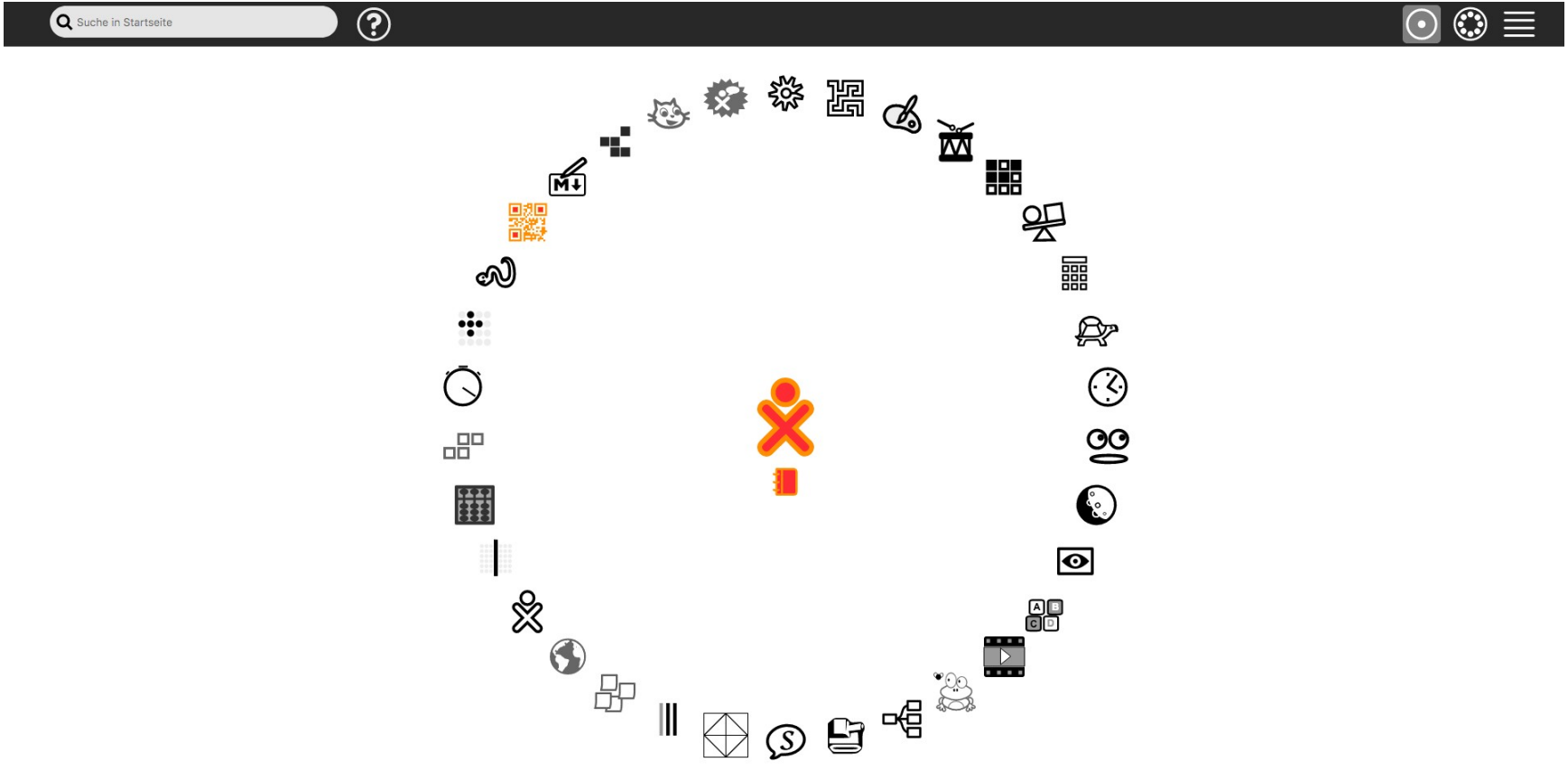
- little hard data about the long-term impact of OLPCs on childhood education.
- Just shipping a computer is simply not enough
- “It’s an education project, not a laptop project” - too much focus on solving technical problems instead of educational problems.
- The project is mostly measured with a “technical benchmark” and their announcements (not the educational impact

OLPC Success

Success

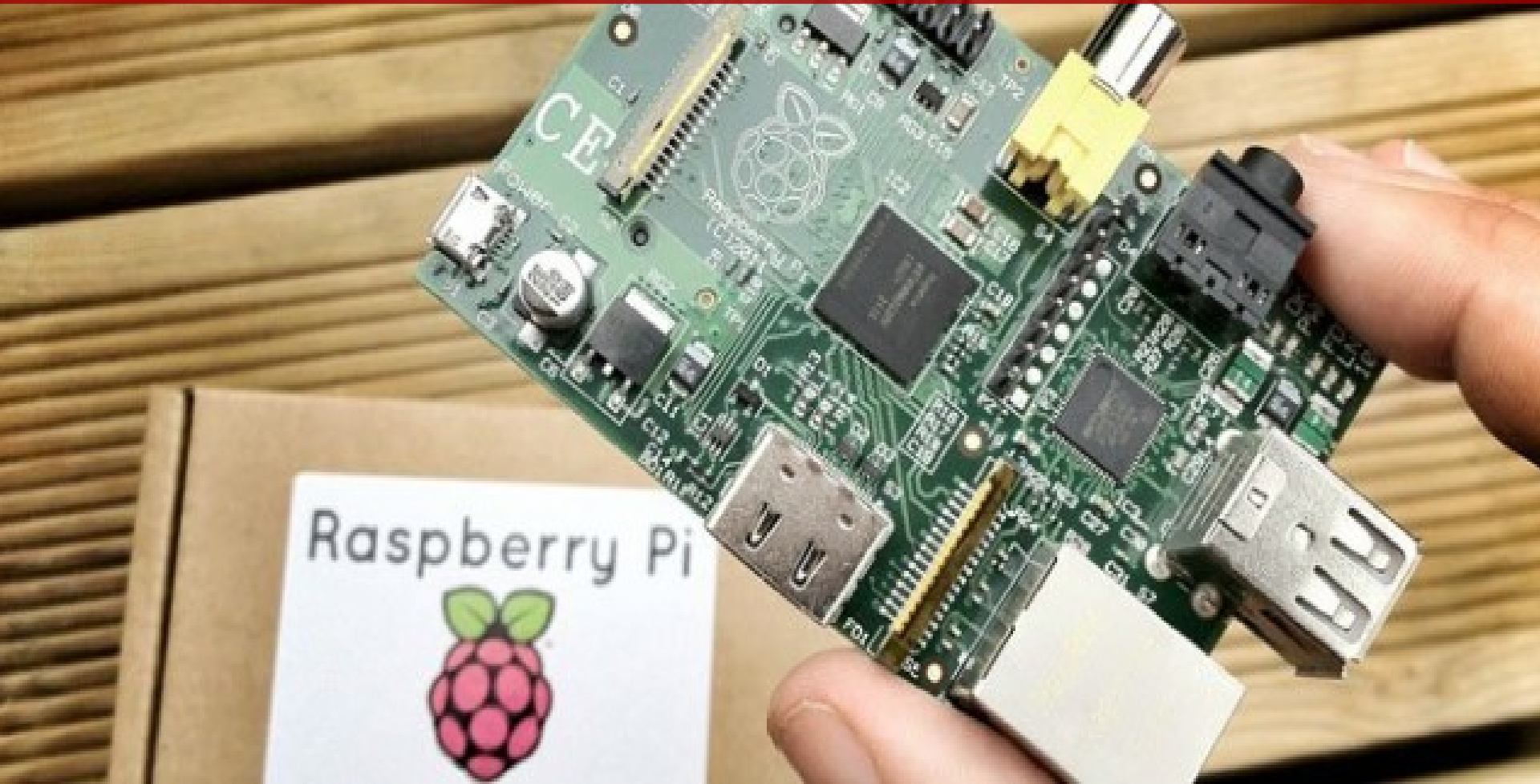
- Awareness and community
- Drive down computer prices during the netbook boom.
- Delivers a big scale case study and lessons-to-learn.
- “Thirteen years ago, OLPC told the world that every child should get a laptop. It never stopped to prove that they needed one.”

Sugar OS

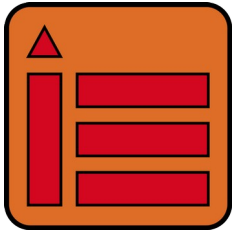


https://try.sugarizer.org

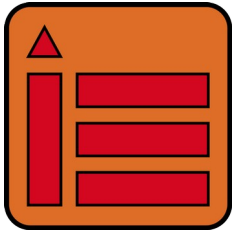
A Cheap Mini Computer for Educational Purposes (Raspberry Pi)



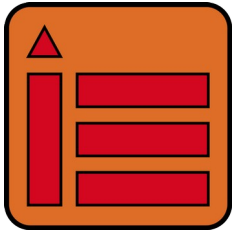
INSO and RISE power Computer Science Education in Rural India



INSO as scientific and educational partner

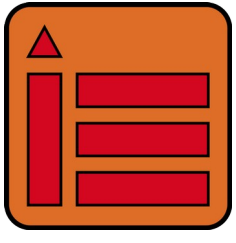


RISE as the hands-on engineering expert



RISE
Research Industrial Systems Engineering

SSE as the educational partner




Outline
RISE – INSO - DECO
What is Scratch?
How does Scratch work?
Project, Passion, Peers and Play
The Scratch Community
RISE Fab-Lab
An Introduction to Scratch
deco


rated the 21st January 2017. It is a spa-
ce for learning and innovation: a place
to play, to create, to learn, to mentor,
to invent.
nskrithi
of engineering
nnovation & creativity
Innovation
Software Requirements


Sanskrithi School of Engineering Puttaparthi wishes
Welcome to our international guests
Azby Brown I Japan
Clarisse Tonon I France
Abhijit Sinha I India
Paul Spiesberger I Austria
Pavan Kumar I India
Chloé Zimmermann I France
Chandrakiran K. Y. I India
WORKSHOP
smart people
for smart cities
futures in education
sanskrithi
group of institutions
27 & 28th I 01 I 2017
driven by innovation & creativity
event for a better world I 2017 & beyond
RISE


SSE
Driven by Creativity & Innovation
DELL


Neufert

సదస్సుల్లో పాల్గొన్న కళాశాల చైర్మన్ విజయభాస్కర్‌రెడ్డి

సాంకేతిక నైపుణ్యం ఎంతో దోహదం

వుట్టపర్తి, న్యూస్‌టుడే: ఆధునిక సాంకేతికత, పరస్పర మార్పిడి, నైపుణ్యం అభివృద్ధికి అంతర్జాతీయ సదస్సు ఎంతో దోహదపడిందని సంస్కృతి కళాశాల చైర్మన్ విజయ భాస్కర్‌రెడ్డి పేర్కొన్నారు. ఆస్ట్రియాలోని వియన్నా విశ్వవిద్యాలయంలో రెండు రోజుల పాటు జరిగిన అంతర్జాతీయ సాంకేతిక అభివృద్ధి, వ్యక్తిగత నైపుణ్యం, ఉద్యోగ అవకాశాలపై సదస్సులో ఆయన పాల్గొన్నారు. సదస్సుల్లో ఒప్పందం మేరకు కళాశాలలో అభ్యసించిన విద్యార్థులకు ఉద్యోగ అవకాశాలు లభిస్తాయని ఈ సందర్భంగా ఆయన పేర్కొన్నారు. యువతకు సాంకేతికతపై పూర్తి స్థాయిలో విద్యార్థులను అవగాహన కల్పించేందుకు సదస్సు ఎంతో ఉపయోగపడిందన్నారు.

జ్యోతి ప్రజ్వలన చేస్తున్న పాల్‌సైబర్గ్

జాతీయ సదస్సు

వుట్టపర్తి అర్బన్: ఇంజినీరింగ్ విద్యార్థులకు సమస్యల పరిష్కారంలో మార్గదర్శకంగా నిలిచే ఇంప్లిమెంటేషన్ ఆఫ్ ప్రాక్టీస్‌పై వుట్టపర్తిలోని సంస్కృతి ఇంజినీరింగ్ కళాశాలలో శనివారం జాతీయ సదస్సు నిర్వహించారు. సదస్సుకు ముఖ్య అతిథిగా ఆస్ట్రియాలోని రైజ్ ఇంజినీరింగ్ సంస్థలో సాఫ్ట్‌వేర్ డెవలపర్ పాల్ సైబర్గ్ పాల్గొని.. ప్రాక్టీస్‌పై విద్యార్థులకు అవగాహన కల్పించారు. సదస్సుకు కర్ణాటక, కేరళ, తమిళనాడు, ఆంధ్ర, తెలంగాణ రాష్ట్రాల నుంచి సుమారు 600 మంది కంప్యూటర్ సైన్స్ ఇంజినీరింగ్ విద్యార్థులు హాజరయ్యారు. సంస్కృతి ఇంజినీరింగ్ కళాశాల డైరెక్టర్ డాక్టర్ నారాయణరెడ్డి, ప్రిన్సిపల్ డాక్టర్ సెంథిల్‌కుమార్, కంప్యూటర్ సైన్స్ ఇంజినీరింగ్ అధ్యాపకులు కేవీ ప్రసాద్‌రెడ్డి పాల్గొన్నారు. సదస్సు ముగింపు సందర్భంగా పాల్‌ను డైరెక్టర్ డాక్టర్ నారాయణరెడ్డి ఘనంగా సన్మానించారు. అనంతరం వివిధ రాష్ట్రాలకు చెందిన విద్యార్థులకు సర్టిఫికెట్లు ప్రదానం చేశారు.

నైపుణ్యా
కంప్యూటర్
నైపుణ్యాభివృ
వారిని
భాగంగా
సంస్థతో
చేపట్టాం.
చెందిన
కంప్యూట
లకు
జాతీయ
- డా
సం

‘డిమాండ్ ఉన్న కోర్సులు ఎంచుకోవాలి’

వుట్టపర్తి టౌన్: విద్యార్థులు ఐటీ రంగంలో డిమాండ్ ఉన్న కోర్సులు ఎంపిక చేసుకుని వాటిలో పట్టు సాధించాలని, అప్పుడే భవిష్యత్ ఉంటుందని ఆస్ట్రియా దేశంలోని రైజ్ యూనివర్శిటీ ఆఫ్ టెక్నాలజీ, ఐటీ విభాగం నిపుణుడు ఫాల్ స్పెసీబర్గర్ ఇంజినీరింగ్ విద్యార్థులకు సూచించారు. వుట్టపర్తి పట్టణంలో సోమవారం సంస్కృతీ ఇంజినీరింగ్ కళాశాలలో ఇంజినీరింగ్ విద్యార్థులకు పలు అంశాలపై శిక్షణ ఇచ్చారు. ఈ సందర్భంగా ఆయన మాట్లాడుతూ ఆర్టిఫిషియల్, ఇంటిలిజెన్స్, మిషన్ లెర్నింగ్, కోడింగ్ రంగాల్లో ఉపాధి అవకాశాలు సులభతరంగా పొందవచ్చునన్నారు. విద్యార్థులు పుస్తక పరిజ్ఞానంపై ఆధారపడకుండా అనుభవపూర్వక జ్ఞానాన్ని పెంపొందించుకోవాలన్నారు. రైజ్ యూనివర్శిటీ ప్రపంచ వ్యాప్తంగా తమతో అనుబంధంగా కొనసాగుతున్న విద్యాసంస్థల్లో విద్యా ప్రామాణాలు పెంపొందించి విద్యార్థులను

విద్యార్థులకు శిక్షణా తరగతులు నిర్వహిస్తున్న ప్రొఫెసర్ ఫాల్‌స్పెసీబర్గన్

నిపుణులుగా తీర్చిదిద్దడానికి కృషి చేస్తోందన్నారు. ప్రిన్సిపాల్ డాక్టర్ సింథిల్‌కుమార్ మాట్లాడుతూ ఇంజినీరింగ్ విద్యార్థులు సాంకేతిక విద్యపై పట్టు పెంపొందించుకోవడానికి శిక్షణా కార్యక్రమాలు ఉపయోగపడతాయన్నారు.

సాక్షి అనంతపురం Tue, 30 July 2019
https://epaper.sakshi.com/c/41947038

సాంకేతిక పరిజ్ఞానానికి దోహదం

వుట్టపర్తి: సాంకేతిక పరిజ్ఞానం, వ్యక్తిగత నైపుణ్యానికి జావా ఎంతో దోహదపడుతుందని ఆఫ్రికా ఆర్ఈసీఈ విశ్వవిద్యాలయ ఆచార్యుడు శ్రీపాల్ పేర్కొన్నారు. మంగళవారం సంస్కృతి ఇంజినీరింగ్ కళాశాలలో విద్యార్థులకు జావాపై అవగాహన సదస్సు నిర్వహించారు. విద్యార్థులకు ఆధునిక సాంకేతిక పరిజ్ఞానం పెంపొందించుకునేందుకు జావా ఎంతో ఉపయోగపడుతుందన్నారు. ఇందులో ఉద్యోగ అవకాశాలు మెండుగా ఉంటాయన్నారు. సర్టిఫికెట్ కార్యక్రమాలు నిర్వహించడం వల్ల ఇంజినీరింగ్ విద్యతో పాటు జావా ఎంతో ఉపకరిస్తుందన్నారు. ప్రతిభ చూపిన విద్యార్థులకు ప్రోత్సాహక బహుమతులను ప్రదానం చేశారు. ఈ కార్యక్రమంలో చైర్మన్ విజయభాస్కర్‌రెడ్డి, అధ్యాపకులు, విద్యార్థులు పాల్గొన్నారు.

అవగాహన కల్పిస్తున్న ఆచార్యుడు శ్రీపాల్

RIT Module 1

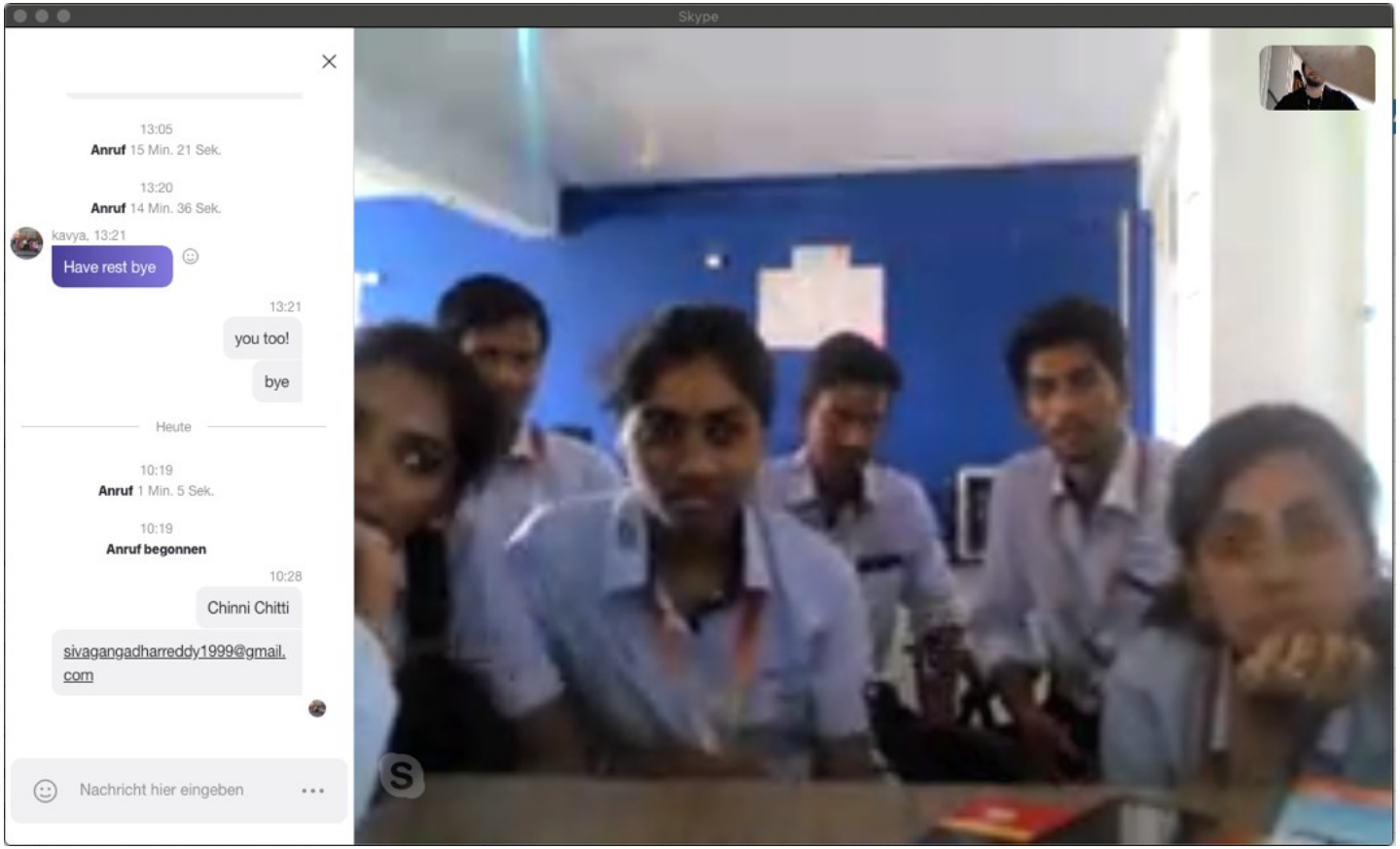
- Communication & Writing Skills
  Business E-Mails, Slack, TypingClub, Diary
- Online Participation
  Wikipedia articles, Stackoverflow.com, Open Source
- Visual Programming with Scratch
  CSFirst and Scratch

https://scratch.mit.edu/
https://csfirst.withgoogle.com

RIT Module 2

- Texted based games (Reaction Game, Number Guessing Game, etc.)
- ASCII Photoshop and others
- Online Resoucres (Sololearn, Stackoverlfow)
- IAESTE Student Alexander Grass from TU Graz

RIT Module System



RIT Module System

- Challenge in remote supervision and lectures
- Overall success

Next Steps

- More Java and real world programming
- IAESTE Students and DAs

Be the next IAESTE student and go to India!

Small visible Outputs

Success

- First time implementation of real software
- Changed Mindset by students
- Partnership
- Shared Lecture
- Lectures with projector!
- Student projects and cooperation
- Austrian students teaching in India

Fails


SSE
SANSKRITHI SCHOOL OF ENGINEERING
RESOURCE PERSON
PAUL SPIESBERGER, RISE GmbH
ONE DAY
NATIONAL CONFERENCE
ON
IMPLEMENTATION OF SCRATCH
Date: March 17th of 2018
Dept of CSE
In Association with
RISE
CSE
WELCOMES
U

Fails

- Cooperation with teaching staff – got much better in 2022
- Motivation by colleagues
- Fight against curricula
- Hardware investment (minimal)
- Student time and engagement

Get Active

- Join **ICT4D.at**
  Website, ICT4D News Android app, new projects are coming up
- Bring in your own projects and ideas
  use the network and get a “fancy” business card
- **Write a Thesis at INSO** in the context of ICT4D:
  https://www.inso-world.com/**rota.html**

ICT4D.at

paul.spiesberger @ict4d.at
@inso-world.com

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ict4d.at