

# eduCORE

## Lightning Talk

**An engineer's, reluctant, journey  
through the realm of a  
qualitative study**

Dr Diarmuid Ó Briain, CEng

**engcore**  
advancing technology







# Common denominator between engineers

- Engineering is a diverse profession
- What is the common denominator

$$\frac{\textit{Computer}}{\phi} + \frac{\textit{Civil}}{\omega} + \frac{\textit{Mechanical}}{\pi} + \frac{\textit{Telecom}}{\lambda} + \frac{\textit{pharmaceutical}}{\delta}$$

$$\frac{\textit{Computer} + \textit{Civil} + \textit{Mechanical} + \textit{Telecom} + \textit{pharmaceutical}}{?}$$





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$$\frac{\text{Computer} + \text{Civil} + \text{Mechanical} + \text{Telecom} + \text{pharmaceutical}}{\phi \omega \pi \lambda \delta}$$

- **Numbers, Quantities, Probabilities,...**







# Qualitative Research

**“Qualitative research is a scientific method of observation to gather non-numerical data”**

- Qualitative research is about the, unique, subjective, human experience
- It is in fact the opposite of numbers;
- So, why would an engineer have an interest in qualitative research?









# The Internet in East Africa

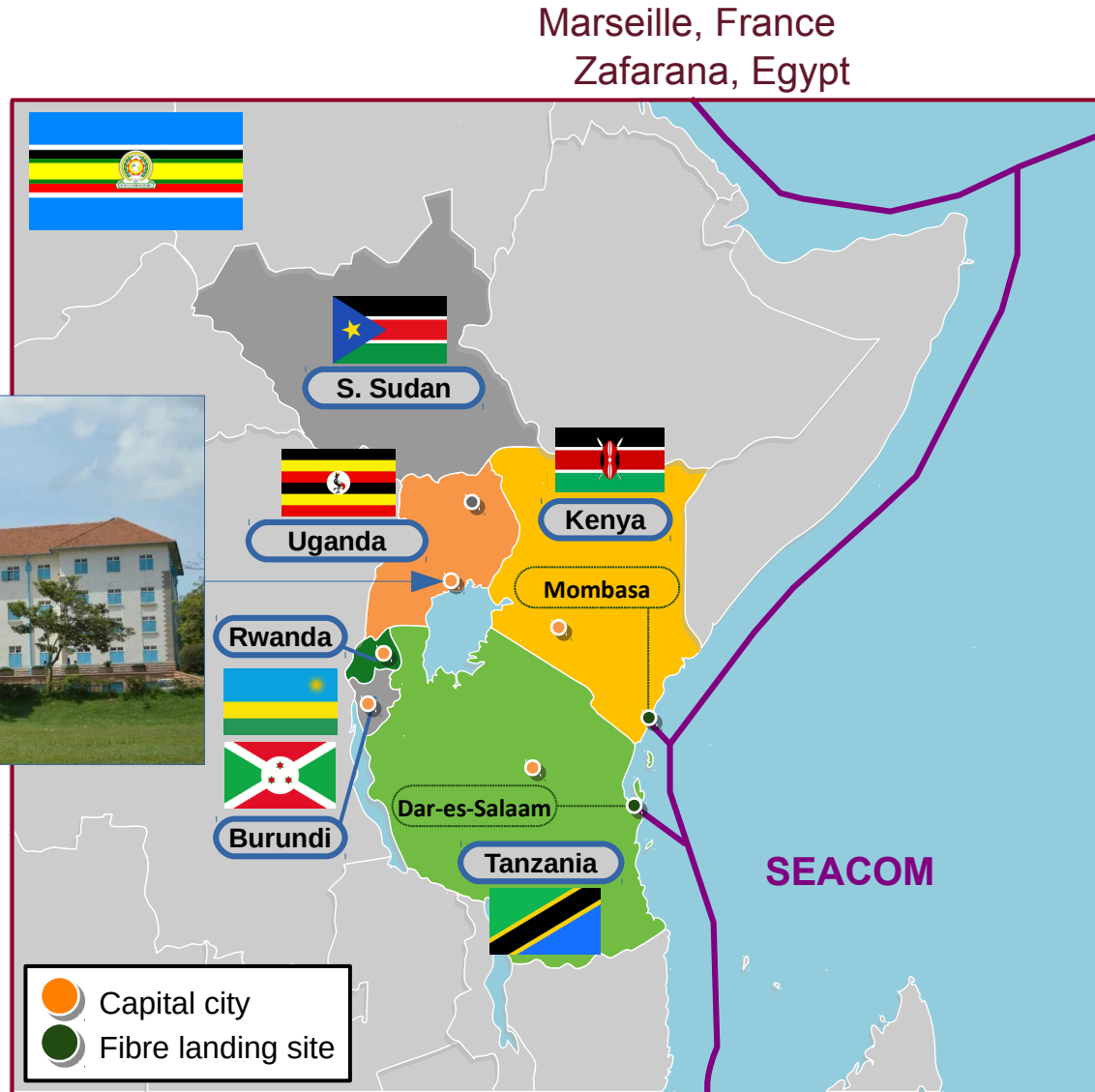




# East African submarine cable – July 2009



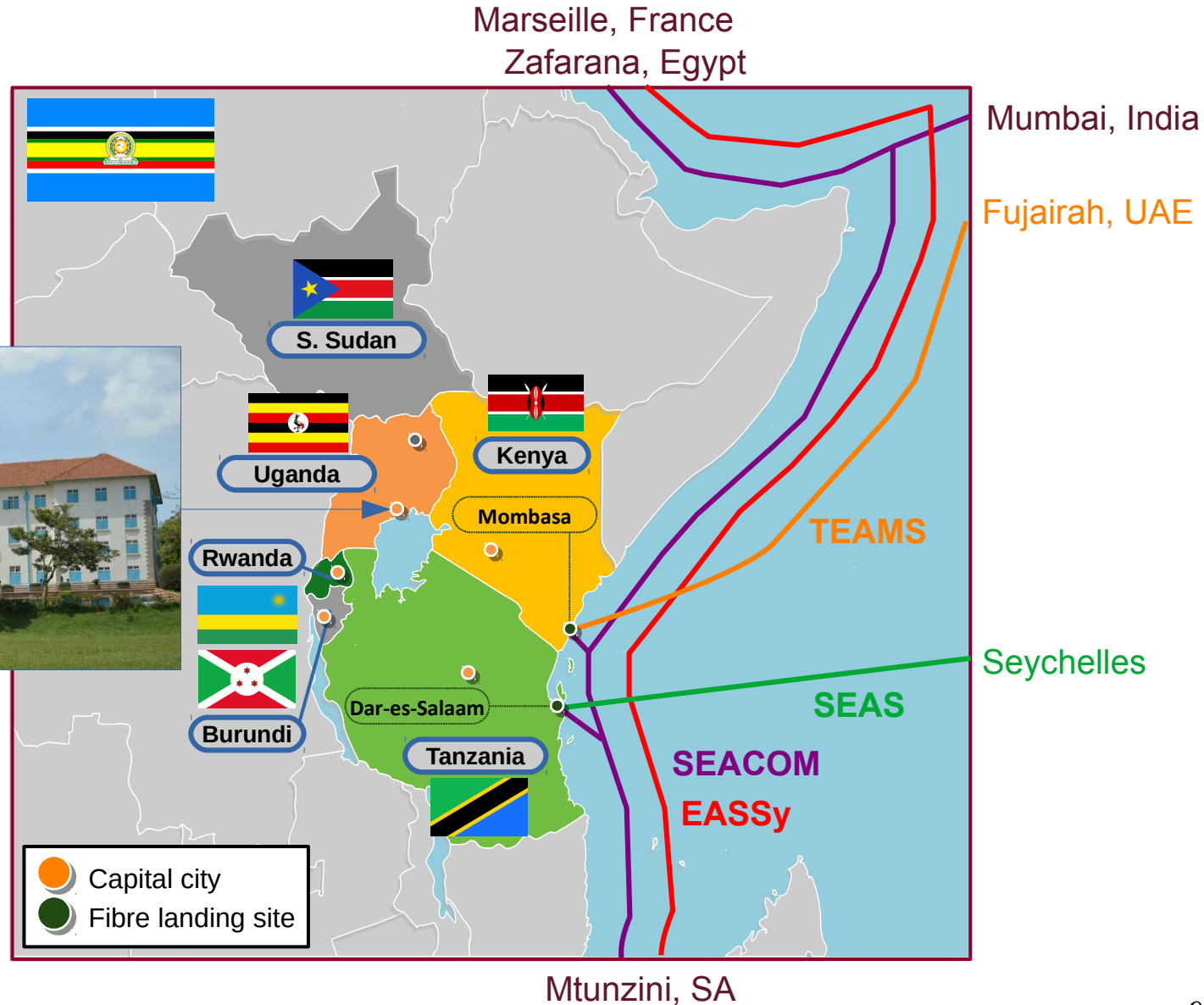
MAKERERE UNIVERSITY



# East African submarine cables – August 2010



MAKERERE UNIVERSITY





## Tanzanian Internet eXchange (TIX) in Dar-es-Salaam



**SEACOM**

Dar es Salaam  
Cable Station

Seacom submarine fibre-optic cable  
landing station close to Dar-es-Salaam,  
Tanzania



# Political economy of the Internet in East Africa





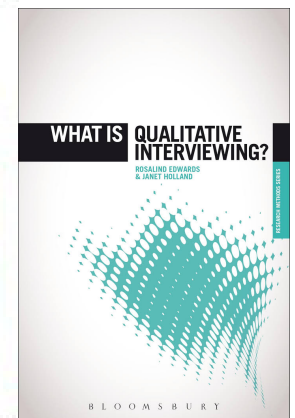
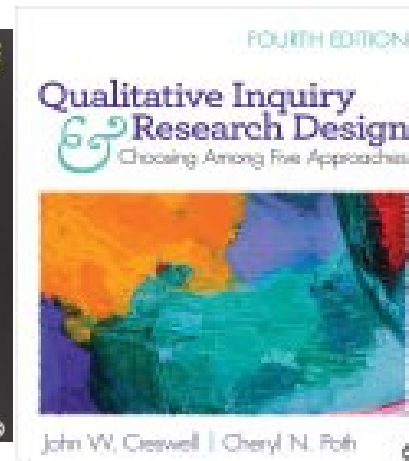
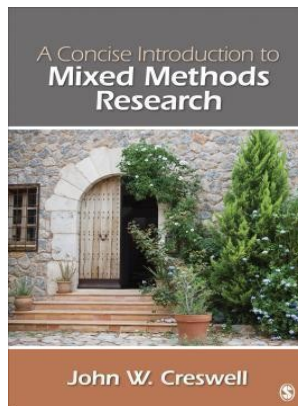
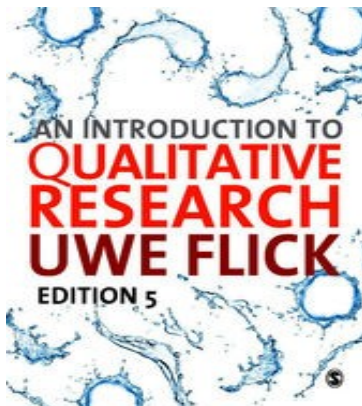


# Qualitative research

- Supervisors meeting in Ireland in Dec 2016
  - Qualitative study
  - What on earth is that?
  - Some reading and Where, Who, What ?
- Irish military archives
  - 1980s, memories of the period in 1916-1922
- So my idea?
  - A history of the Internet in East Africa from the perspective of the implementers since 2009
  - Fresh, in recent memory

# Qualitative research

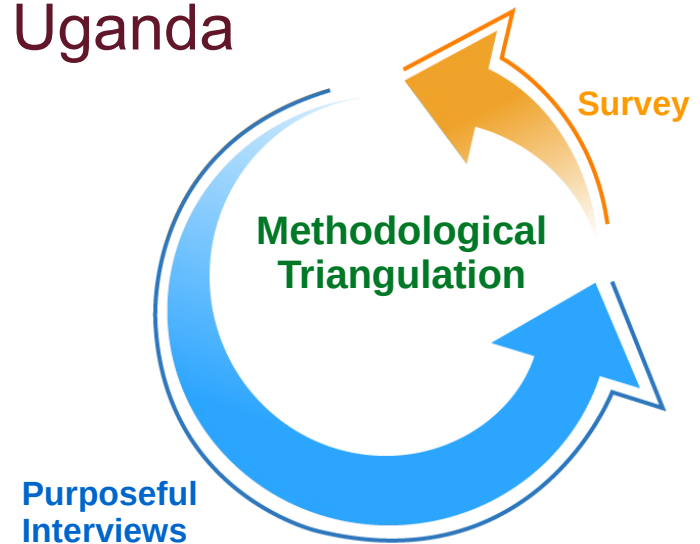
- Qualitative research cross-cutting course with DRGT, Makerere University
  - Only engineer or scientist on the course
  - Lots of reading material for humanities, very little for engineering and science
    - Kelly, Kevin and Bowe, Brian (2011) Qualitative Research in Engineering Education. TUDublin.
    - Kelly, Kevin. (2016). A Different Type of Lighting Research: a Qualitative Methodology. TUDublin.





# Methodological triangulation

- Purposeful interviews
  - Industry leaders in sub-region of EA
    - Kenya / Rwanda / Tanzania / Uganda
- Internet survey
  - Engineers, academics
    - AfNOG / AfPIF / IST-Africa
- Mixed method approach
  - “*both rich in quality and thick in quantity*” (Dibley, 2011)



Uganda Internet eXchange Point  
Communications House,  
Coville Street, Kampala



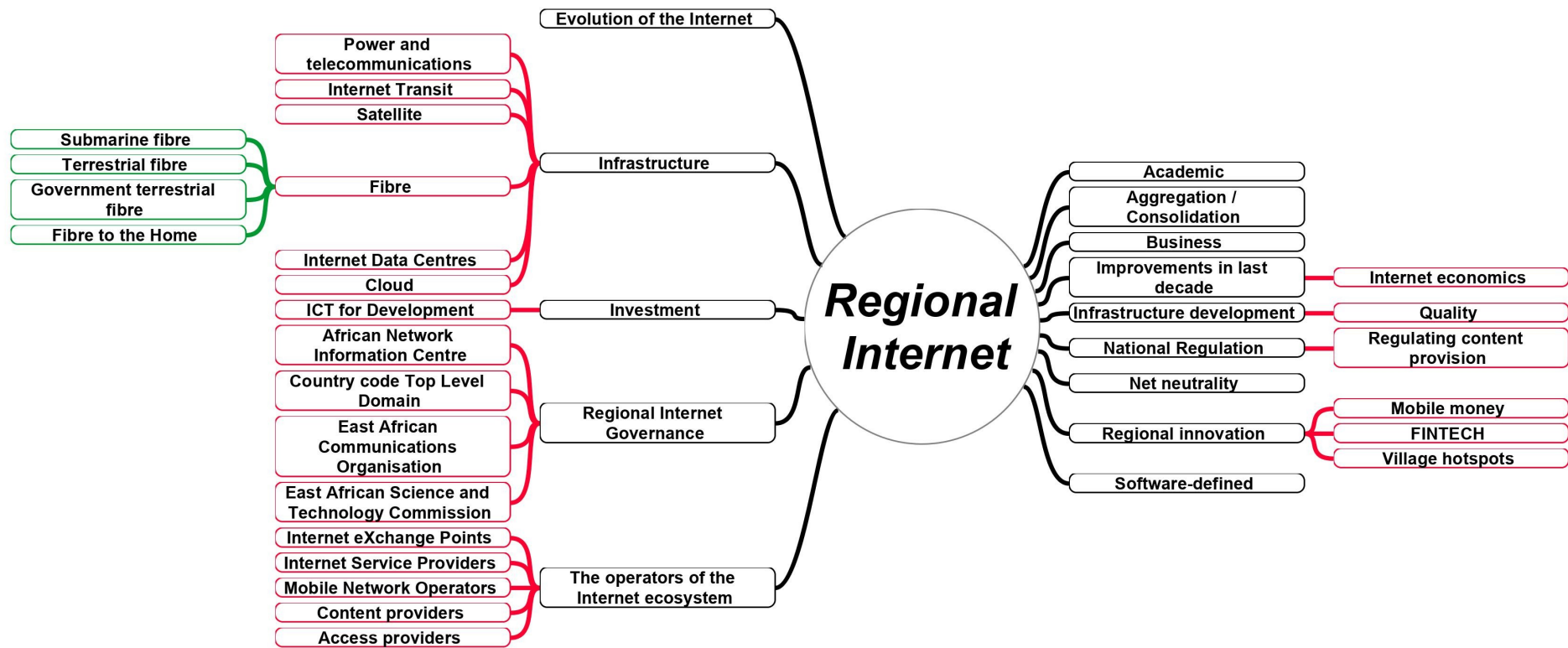


- Interview guide
- Ethical approval
- Arrange interviews
  - 24 Subject matter experts, thought leaders
  - Kampala / Nairobi / Kigali / Dar-es-Salaam
- Open-source, so no NVivo
  - Transcriber – Transcription of interview audio
  - RQDA() – R Qualitative Data Analysis





- Analysis
  - Deductive approach





# Internet survey

- Internet survey [online + paper versions]
- Ethical approval
- Groups
  - African Network Operators Group (AfNOG)
  - ISTA, Botswana – Information Society Tech - Africa
  - AfPIF, South Africa – Peering and Internet Forum

Group	N (pop)	$n_{km}$ (K&M)	$n_h$ (FPCF)	n (Actual)
AfNOG	49	43.56	23.31	34
IST-Africa	41	37.13	19.74	21
AfPIF	54	47.45	25.51	28
Total	144	104.93	60.95	83

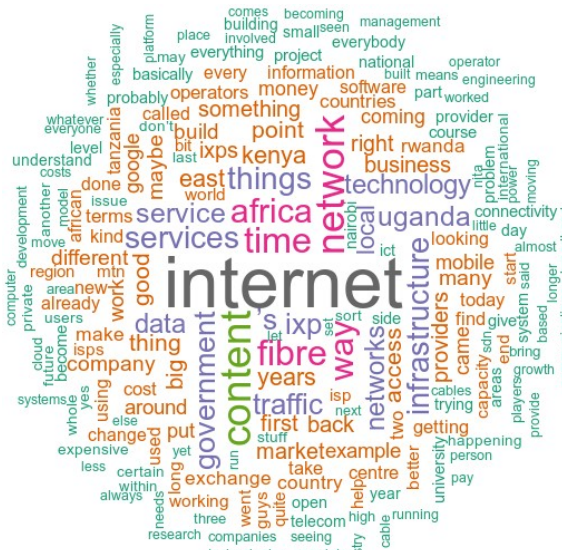
Krejcie, R. V. and Morgan, D. W. (1970). Determining sample size for research activities, Educational and psychological measurement, 30(3), pp. 607–610.

Hoyle, R. H. (2018). Analysis Techniques for Small population Research. Improving Health Research on Small Populations: Proceedings of a Workshop. National Academies of Sciences, , pp. 87–102. National Academies Press.



- Format
  - Ranked (Five questions)
  - Likert scale (Five questions)
  - Multiple choice (Two questions)
  - Polar (Two questions)
- Statistical significance analysis –  $\chi^2$  model
  - $H_0$  : *“There is homogeneity between the answers given by respondents at each conference and the answers given by respondents from the AfNOG mail-list ”*

## A black Zoom H4 digital audio recorder. It features a large, textured microphone grille on top with a control knob and a red level indicator. The front has a small LCD screen displaying '20:00' and '12:00:00'. Below the screen is a red record button. The side of the device shows a 'LINE IN' port and a 'PHONES' jack.

The logo for Engcore, featuring the word "engcore" in a lowercase, sans-serif font. The "e" and "n" are grey, "g" is blue, "c" is grey, "o" is a solid blue circle, "r" is grey, and "e" is grey. Below "engcore" is the tagline "advancing technology" in a smaller, blue, lowercase, sans-serif font.

**Instructions**

There are 7 sections to the survey and in each a number of options are represented. Questions are either:

(a) ☐ Multiple choice, pick only one answer from a range of options by placing a mark on the preferred option.

(b) ☐ Yes/No/ Maybe questions. Select only one preferred option and if it is either Yes or Maybe then feel free to specify why you made that choice in the text box provided.

(c) ☐ Vote \_\_\_\_\_ for three of the given options in order of priority, 1, 2 and 3.

**Education and Job function**

The purpose of this section is to discover the education level and type of internet practitioners across the region.

**Nationality** - Select your nationality.

☐ Ugandan ☐ Kenyan ☐ Rwandan ☐ Tanzanian ☐ Burundian ☐ South Sudanese ☐ South African  
☐ Ethiopian ☐ Mosotho ☐ Malawian ☐ Mozambican ☐ Namibian ☐ Zimbabwean ☐ Zambian  
☐ Other African

**Country of Employment** - Select the country where your job is based.

☐ Uganda ☐ Kenya ☐ Rwanda ☐ Tanzania ☐ Burundi ☐ South Sudan ☐ South Africa  
☐ Botswana ☐ Lesotho ☐ Malawi ☐ Mozambique ☐ Namibia ☐ Zimbabwe ☐ Zambia  
☐ Other African

**Education Level** - Select the education level that most appropriately matches your tertiary education.

☐ Doctorate ☐ Masters ☐ Honours Degree ☐ Diploma ☐ Certificate ☐ Apprenticeship ☐ Other

**Education Discipline** - Select the discipline that most appropriately matches your tertiary education.

☐ Computer Science ☐ Computer Engineering ☐ Telecommunications Engineering ☐ Information Security  
☐ Other computing related discipline ☐ Other non computing related discipline

**Current job role** - Select the jobrole that most appropriately matches your current employment.

☐ Engineering Manager ☐ Project Manager ☐ Engineer ☐ Technician ☐ Other \_\_\_\_\_

**Current employer type** - Select the most appropriate employer type.

☐ Traditional Telecom Provider ☐ Internet Service Provider ☐ Mobile Network Operator ☐ Data Centre  
☐ Internet exchange Point ☐ Cloud Provider ☐ Content Provider ☐ Enterprise  
☐ Education Network ☐ Academic/ Research ☐ Government entity ☐ Vendor  
☐ Application Provider ☐ Integrator ☐ Reseller ☐ Other

**Experience** - How many years have you worked in industry.

☐ 1 - 5 years ☐ 6 - 10 years ☐ 11 - 15 years ☐ 16 - 20 years ☐ 21 - 25 years ☐ Greater than 25

**The Internet today in Africa**

What are your thoughts on how the Internet is delivered across the region today?

**The state of the Internet in the region over the last 10 years** - Select your opinion.


☐ Very improved ☐ Slightly improved ☐ No Change ☐ Slightly diminished ☐ Very diminished

**The key catalysts for change on the Internet has been**

Select your 1, 2 and 3 key catalysts for change over the last 10 years.

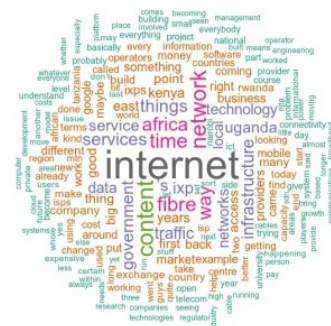
Vote (only 1 of each)

<input type="checkbox"/> Submarine cables linking fibre networks	<input type="checkbox"/> National terrestrial fibre networks	<input type="checkbox"/> Fibre to the home (FTTH)	<input type="checkbox"/> Mobile Network Operators	<input type="checkbox"/> Satellite availability	<input type="checkbox"/> Cloud services	<input type="checkbox"/> Internet exchange Points (IXPs)
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## Purposeful Interviews

## Methodological Triangulation

## Survey



# Conclusions & Recommendations





# Qualitative research in engineering ??

- Potential to add value where human experience is required
- Extract the “*experience*” of subject matter experts, thought leaders
- Triangulate **qualitative data** with more **quantitative style data** in a **mixed methods** study
- Opportunity to **compare** thought leaders with a wider study
- **It certainly has a place in engineering** as solutions are built for humans after all.



# Clan youth leader using the Internet in a Minyatta, Nadunget, Karamoja





Bóthar Chill Chainnigh, Ceatharlach

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Innealtóir Cairte

Léachtóir



Athena  
SWAN  
Bronze Award



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