INTER-REGIONAL WEEK ON EMERGING TECHNOLOGIES FOR DEVELOPMENT FOR THE ARAB AND AFRICAN REGIONS

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OUTLINE

- Context of presentation
- Malawi ICT data 2018
- Prerequisites for Emerging Technologies (Some)
- Highlights of broadband in Malawi
- (Indicative) Roadmap for Malawi - to be refined
- Way forward for adoption of Emerging technologies
- Examples of (possible) emerging technologies for Malawi

CONTEXT OF PRESENTATION

- SADC has approved 10 broadband targets for 2025 in line with the Broadband Commission
- There are improvements in ICT infrastructure and applications
- However, there are gaps in the realm of emerging technologies that need to be addressed
  - hence ITU WTDC -17, Buenos Aires, Argentina Regional Initiatives
- Urgency due to COVID 19 pandemic
- Imperative to achieve UN 2030 Agenda (SDGs)
- ICT are crucial to the UN20230 Agenda
- There is need to bridge existing gaps in adoption of emerging technolgies

MALAWI ICT DATA

Sub-Saharan Africa	Country data		Low income
	2010	2016	Low-income group 2016
Economic and social context			
Population (millions)	15	18	659
Urban population (% of total)	16	16	31
GNI per capita, *World Bank Atlas* method ($)	430	320	612
GDP growth, 2005–10 and 2011–16 (avg. annual %)	7.7	3.9	5.0
Adult literacy rate (% ages 15 and older)	61	62	61
Gross primary, secondary, and tertiary school enrollment (%)	68	..	59

Sector structure			
Separate telecommunications/ICT regulator	Yes	Yes	
Status of main fixed-line telephone operator	Mixed	Mixed	
Level of competition (competition, partial comp., monopoly)			
International gateway(s)	C	C	
Mobile telephone service	P	C	
Internet service	P	C	
Foreign ownership (not allowed, restricted, allowed)	*R*	*R*	
Reg. treatment of VoIP (banned, closed, no framework, allowed)	C	B	
Sector efficiency and capacity			
Telecommunications revenue (% of GDP)	*3.0*	*4.0*	..
Telecommunications investment (% of revenue)	..	*59.4*	..
Sector performance			
Access			
Fixed-telephone subscriptions (per 100 people)	1.0	0.1	0.8
Mobile-cellular telephone subscriptions (per 100 people)	20.8	40.3	60.2
Fixed-broadband subscriptions (per 100 people)	0.0	0.0	0.3
Households with a computer (%)	2.8[a]	6.4[a]	5.6
Households with Internet access at home (%)	5.0[a]	11.5[a]	9.9
Usage			
Int'l. voice traffic, total (minutes/subscription/month)	..	*2.4*	..
Domestic mobile traffic (minutes/subscription/month)	5.2	*45.0*	*51.0*
Individuals using the Internet (%)	2.3	9.6[a]	12.5

Quality			
Population covered by at least a 3G mobile network (%)	*2*	42	56
International Internet bandwidth (bit/s per Internet user)	2,034	4,201	3,964
Affordability			
Mobile-cellular sub-basket ($ a month)	*10.8*	7.5	8.0
Fixed-broadband sub-basket ($ a month)	*492.6*	7.0	25.3
Mobile-b'band, prepaid handset-based, 500 MB ($ a month)	*9.4*	4.2	5.8
Mobile-b'band, postpaid computer-based, 1 GB ($ a month)	..	7.3	11.0
Trade			
ICT goods exports (% of total goods exports)	0.4	*0.1*	..
ICT goods imports (% of total goods imports)	5.2	*3.3*	*4.1*
ICT service exports (% of total service exports)	12.6	*28.4*	*22.9*
Applications			
Online service index (0-1, 1=highest presence)	0.02	0.22	0.17
Secure Internet servers (per million people)	0.3	1.9	1.7

SOME PREREQUISITES FOR ADOPTION OF EMERGING TECHNOLOGIES

- Policy, regulation, laws (Malawi ICT sector is at 4G regulation) and institutional framework
- ICT infrastructure, specifically broadband and Supporting infrastructure, particularly power supply
- Digital skills
- Research, innovations and incubations
- Efficient utilization of scarce resources such as spectrum, right of way

POLICY AND REGULATION

- Policy and regulation have important implications for adoption of emerging ICT technologies
- **According to Doreen Bogdan-Martin, Director BDT**
  - “There is much to navigate: the landscape is complex and fast moving. As mobile phones host ever more online services, regulators find themselves grappling with an ever-growing array of challenges including digital identity, data protection, blockchain and Artificial Intelligence (AI).
  - There remains, too, the key challenge of achieving the Sustainable Development Goals (SDGs) by the deadline of 2030, now just a decade away... This year’s report (2020) is especially exciting in that we have evolved our work on collaborative regulation to feature a new tool that sits alongside the ITU Regulatory Tracker – the Benchmark of Fifth Generation Collaborative Regulation”

HIGHLIGHTS OF BROADBAND GAP ANALYSIS (SURVEY, 2019) FOR MALAWI

- Policy and regulation
  - There is need for
    - A mechanism for tracking of broadband
    - best practice regulations for BB
    - Effective enforcement of existing national regulations related to ICTs
- BB infrastructure in Malawi
  - mobile broadband 3G (56%), 4G (34%),
  - fixed line x DSL,
  - satellite and fibre optics (>3000km).

- Infrastructure barriers to broadband access in Malawi:
  - Network coverage
  - Access devices
  - Power supply
- This situation impacts the adoption of emerging technologies

- Preferred technologies for broadband in Malawi in order of priority (ITU Broadband Gaps Analysis Survey, 2019) are
  - Mobile broadband comprising 4G/LTE, 5G,
  - OFC: for both transport and access
  - Satellite
  - HAPS

SOME BROADBAND NEEDS FOR MALAWI

- The demand side factors:
  - awareness creation and promotion of emerging technologies,
  - digital skills,
  - Improvement of service quality, and
  - More affordable broadband service
  - Relevant content and applications

- On the supply side, there is need for
  - more efficient business models,
  - More effective financing models,
  - More BB infrastructure: transport and access
  - enhanced access to right of way regulations and high cost of development of broadband

OBSERVATION

- The ICT data for Malawi suggests the need for improvement in order to lay the foundation for the deployment of applications in the framework of emerging technologies.
- Similarly, the SADC Broadband Gap analysis (ITU 2019 [draft]) indicated the need to deal with gender parity so that no one is left be hind

(INDICATIVE) EMERGING TECHNOLOGIES ROADMAP FOR MALAWI - TO BE REFINED

- Policy and regulation
- Legal and institutional framework
- Infrastructure coverage: transport (predominantly OFC) and access FTTx, mobile broadband
- Applications: complete suite of intelligent services across ass sectors of the socio- economy…applications that are aligned with development goals (country Vision, SDGs …
- Security: of infrastructure, data and privacy; critical information infrastructure protection
- Digital skills

WAY FORWARD FOR EMERGING TECHNOLOGIES

To embrace collaboration and metrics across social, economic, political and technological arenas (Refer to SDG 17)

Why collaboration?

- The digital journey brings together all players – from different backgrounds and sizes – into one living network.
- Collaboration gives all the opportunity to participate in decision-making, in contributing to the success of others and in forging inclusive momentum around the mission.

Why metrics?

- Rules and decisions must find their logic in current, detailed evidence and in market data rather than in wishful thinking, opinion and theory.

EXAMPLES OF POSSIBLE EMERGING TECHNOLOGIES FOR MALAWI

- A number of emerging technology applications are possible

5G

- 5G offers improvements over 4G, such as low latency, intelligent power consumption and high device density.
- It will make augmented reality, smart cities and connected vehicles possible.

IoT

- The Internet of Things combines information from connected devices and allows for analytics of systems which in turn leads to efficiencies in various sectors including in transport manufacturing and in social sectors .
- *These platforms, devices and datasets provide additional insights and efficiencies for organisations of all types*

ARTIFICIAL INTELLIGENCE

- AI claimed the top spot on the list. Artificial intelligence refers to programmed algorithms that automatically parse and apply knowledge.
- It is the largest force in emerging technology, and includes security and sales applications for businesses.

BIOMETRICS

- Security will be improved by biometics by allowing people and devices to authenticate and move seamlessly through the world.
- Biometric registration kits are available to most government as an asset and various departments can use them.
- For example, the health department use them to register live births and the electoral commission for voter registration.

AUGMENTED REALITY/VIRTUAL REALITY

- AR and VR transform how people engage with machines, data and each other.
- Through AR/VR enterprise/organisation can use mixed reality, AI and sensor technologies to enhance execution flexibility, operational efficiency and individual productivity.
- AR/VR technology has experienced generally slow adoption and spread across industries, including the logistics industry.
- However, societal and workforce policies set in place due to COVID-19 may be the required catalyst for widespread acceptance.
- As working remotely becomes more commonplace, international business travel more complicated, and in-person meetings less necessary, businesses, including those within the logistics industry, should expect to see AR/VR presence permeate their sectors in the near future.

BLOCKCHAIN

- There is an ever-increasing need to be able to secure and manage transactions across the internet, and blockchain is the answer. Blockchain manages data and supply chain challenges.

Blockchain – Trado Model

- In the context of the Trado model, pilot transactions in Malawi's tea sector a blockchain called Ethereum was used. Anybody can run a node of the Ethereum blockchain on their computer to help validate transactions and create blocks. Much of Ethereum's basic functionality is similar to other blockchains; it allows for the entry of transaction records and validates that these transactions have actually taken place through node-based consensus
- This is in support of SDG 12: Responsible Consumption and Production; the Trdao is by the University of Cambridge, Institute for Sustainability Leadership

ROBOTICS

- Robotics are shifting from industrial use to service delivery and are impacting home and businesses, both physically and virtually.
- These require machine learning, AI etc

ARTIFICIAL INTELLIGENCE & ROBOTICS

- Applications of drones and robotics can make the country better by bringing cutting edge technological solutions to areas they can make the most impact like increasing agricultural production for rural farmers, improving conservation efforts of forests and using data and artificial intelligence to keep vulnerable communities safe from climate change.

QUANTUM COMPUTING AND SENSING

Quantum computing:

- The ability to process and analyze big data will be impacted by quantum computing.
- It is the key to leveraging machine learning and the power of AI

Quantum sensing

- Imagine self-driving cars that can “see” around corners, or portable scanners that can monitor a person’s brain activity. Quantum sensing could make these things and much more a reality.
- Quantum sensors operate with extreme levels of precision by exploiting the quantum nature of matter – for example, using the difference between electrons in different energy states as a base unit.
- Most of these systems are complex and expensive, but smaller, more affordable examples are being developed that could open up new uses.

VIRTUAL PATIENTS

- Clinical trials require human beings… however, if the goal of swapping humans for simulations to make clinical trials faster and safer sounds simple, the science behind it is anything but…
- ….data taken from high-resolution images of a human organ is fed into a complex mathematical model of the mechanisms that control that organ's function. Then, computer algorithms resolve the resulting equations and generate a virtual organ that behaves like the real thing. Such virtual organs or body systems could replace people in the initial assessments of drugs and treatments, making the process quicker, safer and less expensive.
- The implication of this is Big Data and related analytics

- **DIGITAL MEDICINE**
  - Digital medicine won’t replace doctors any time soon, but apps that monitor conditions or administer therapies could enhance their care and support patients with limited access to health services.
  - Many smart watches can already detect if their wearer has an irregular heartbeat, and similar tools are being worked on that could help with breathing disorders, depression, Alzheimer’s and more.
  - **Pills containing sensors are even being developed – these send data to apps to help detect things like body temperature, stomach bleeds and cancerous DNA.**

SPATIAL COMPUTING

- Spatial computing is the next step in the bringing together of physical and digital worlds we're already seeing with virtual-reality and augmented-reality apps.
- As with VR and AR, it digitizes objects that connect via the cloud, allows sensors and motors to react to one another and creates a digital representation of the real world. But it goes even further, adding spatial mapping that lets a computer "coordinator" track and control the movements and interactions of objects as a person moves through the digital or physical world.
- This technology will bring new developments in how people and machines interact, in industry, healthcare, transportation and the home.

SERVERLESS COMPUTING

- Serverless computing, or Function as a Service (FaaS), allows companies to build applications that scale in real time so that they can respond to demand that can change instantly depending on orders of magnitude.
- FaaS offers a consumption-based platform so that developers can quickly and cost effectively deploy applications.

- **NATURAL LANGUAGE PROCESSING**
  - NLP is a field of AI that enables computers to analyze and understand human language.
  - Speech-to-text converts human language into a programming language. Text-to-speech converts a computer operation to an audible response.
  - These processes requires digitalization

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