Use of Information and Communication Technologies (ICTs) to Power High Impact International Collaborations with Africa in Cancer Care, Research and Education

A paper delivered at the Global Health Catalyst Cancer Submit
@ Harvard Medical School, Boston, USA
20th March, 2015

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Outline

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  - eHealth
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  - Mobile Technology Intervention & Strategies

Outline

- ICT framework for Collaboration with Africa
- The Research potentials in Covenant University
- Recommendations and Conclusion

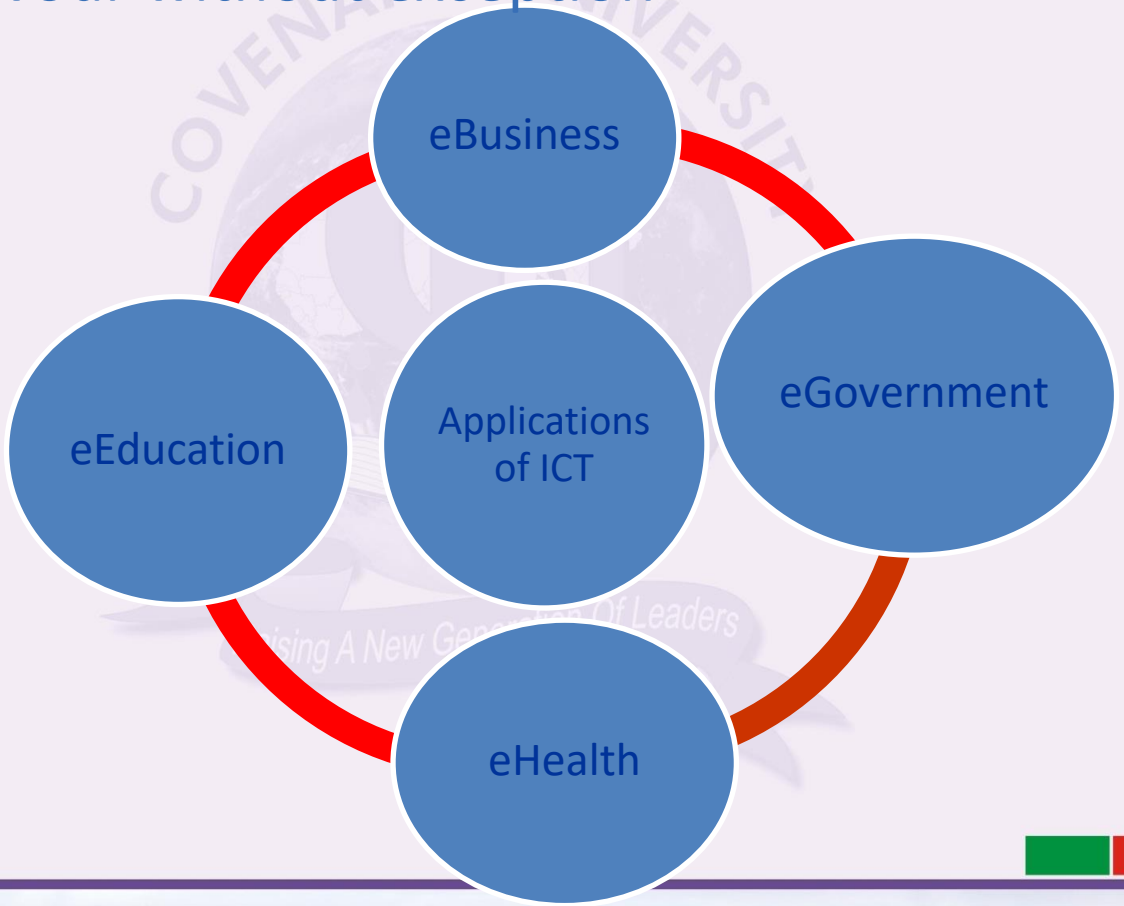
Introduction

- The world leaders assembled in Geneva in the year 2000 to formulate the MDGs
  - They were aimed at reducing poverty be 50% by the year 2015.
  - Where are we now?
- By Dec. 2003 , there was the world summit on information society (WSIS), tagged:
  - "*Building the information society: a global challenge in the millennium*".

Introduction Cont'd

- Arising from the summit is the fact that
  - ICT was recognized as a panacea for fulfilling the Millennium Development Goals (MDGs) formulated in the year 2000;
  - hence, the concept of:
    - eGovernment and eDemocracy;
    - ePolicing and eHealth, and;
    - eLearning among others came to the fore.

- The adoption of ICT has permeated every facet of human endeavour without exception



ICT Defined

- ICT is an umbrella term that refers to:
- any communication device or application, which comprises:
  - radio, television, cellular phones, computers and networks, satellite systems and so on,
  - as well as the various services and applications associated with them,
  - such as videoconferencing, telemedicine, webinar and online education.

ICT Cont'd

- Thus, ICTs offer a medium that facilitate:
  - acquisition, processing and transmission of information in a cost effective way with minimized obstacles of distance and time (Ayo, 2009).
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Classification of ICT

- Notably, the major classifications include (Ajhoun and Abik 2011 and Song and Yoon 2011):
  - Mobile: anywhere, anytime access. Prefixed ‘m’;
  - Internet: transaction via the Net. Prefixed ‘i’;

Introduction Cont'd

- Pervasive: anywhere, anytime through any mobile/wireless device.
- This is the current level of development that stems from the advent of ubiquitous and wearable computing, ambient intelligence and context awareness. Prefixed 'p' or 'u'(ubiquitous); and
- Television: transaction via the television set. Prefixed 't'.
- Mobile: anywhere, anytime access. Prefixed 'm';

eEducation Described

1. eEducation

- ICT can improve:
  - universal access to education, equity in education;
  - delivery of quality learning and teaching, as well as;
  - foster collaboration between academics and researchers in disparate locations in the world.

Introduction Cont'd

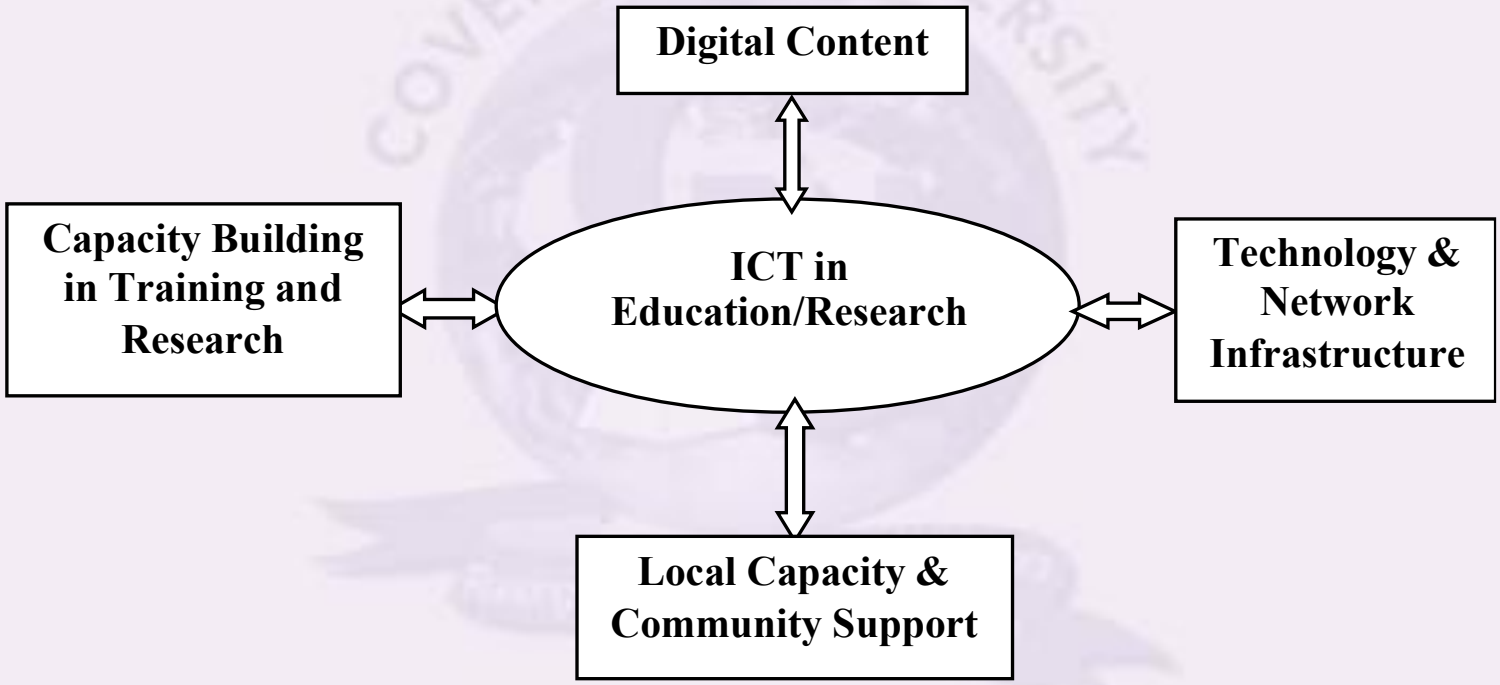


Figure 1: Application of ICT in Education and Research

eHealth Described

2. eHealth

- ICTs have played a critical role in improving health care for individuals and communities, particularly for nationals of low resourced countries.

- ICT provides new and more efficient ways of accessing, communicating, and storing information;

Introduction Cont'd

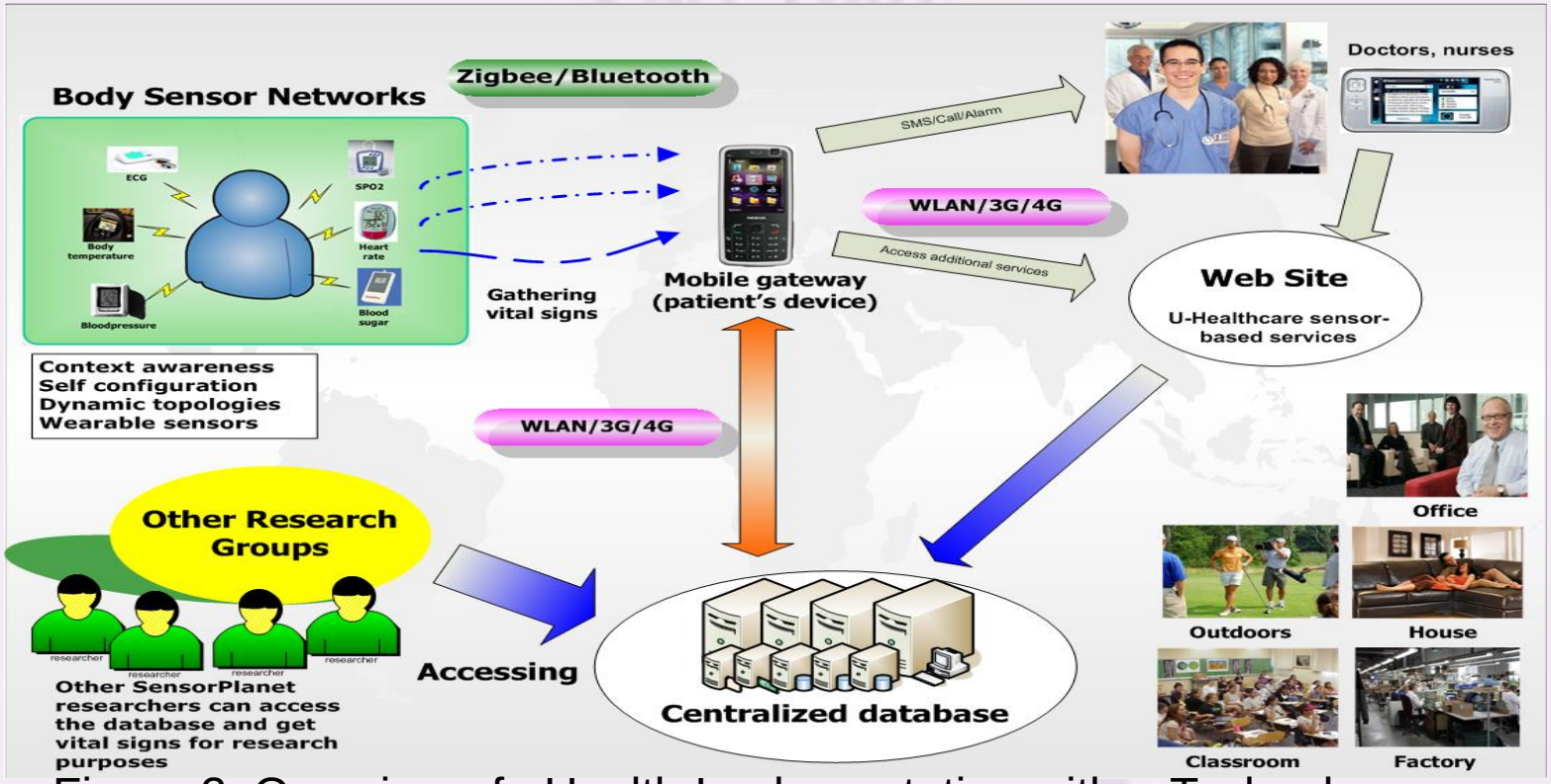
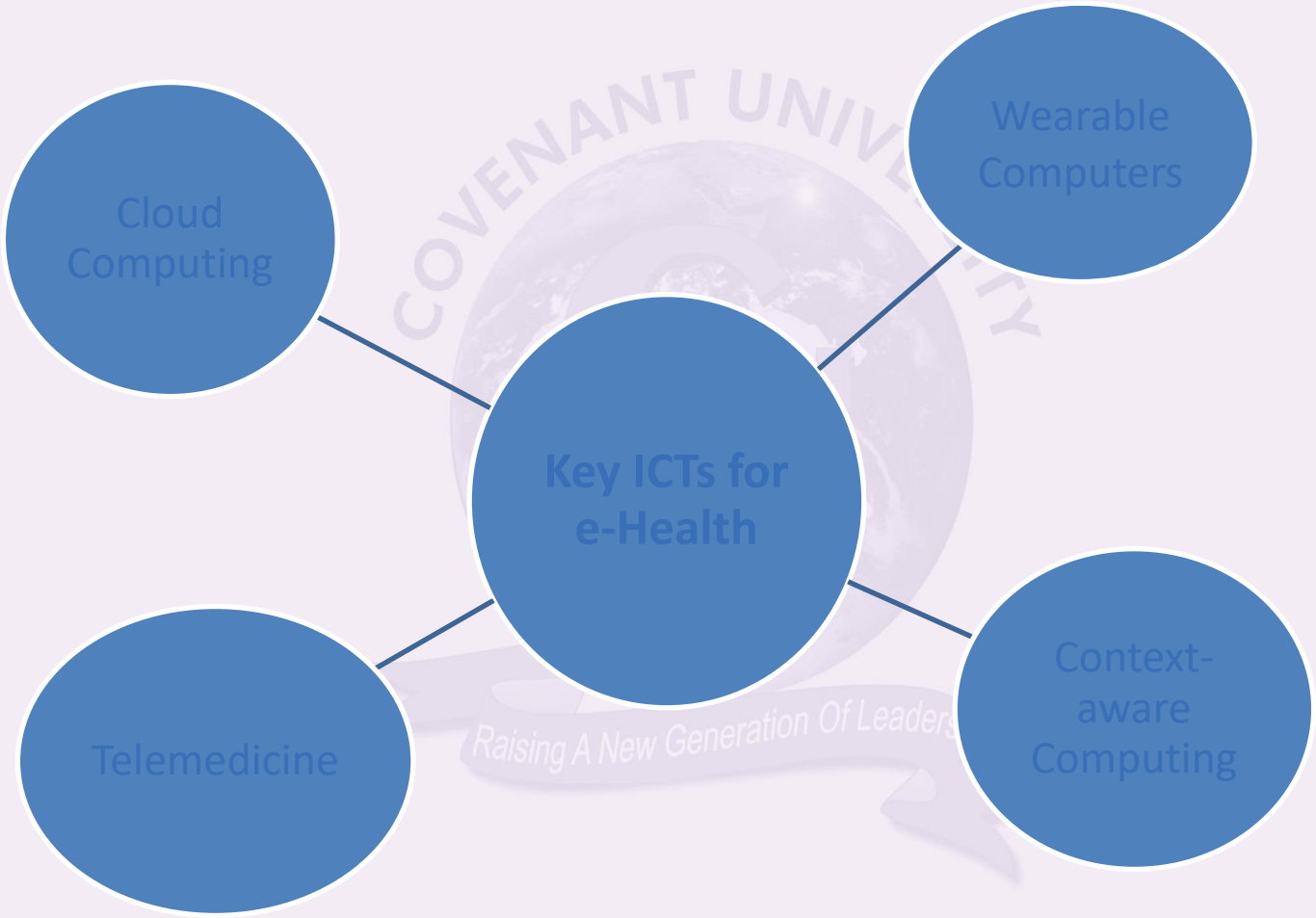


Figure 2: Overview of eHealth Implementation with mTechnology [Source: https://hchen84.wordpress.com/page/2/]


Cloud Computing
Wearable Computers
Key ICTs for e-Health
Telemedicine
Context-aware Computing

- Aplication of IT in Health

✓ **Wearable Computers:** These are small electronic devices that can be worn by the bearer under, with or on top of clothing.

– wearable computers are used to facilitate continual measurement of biological signals of a user, which gives information of the user from wearable sensors (Kang et al., 2006).

Wearable Computer

- ✓ **Context-aware:** Context-aware computing is a computing paradigm in which applications can discover and take advantage of contextual information such as:
  - user location, time of day, neighbouring users and devices, and user activity.
- They provide the online information needed for users and caregivers to react quickly to life-threatening events.

- **Telemedicine:** This is:
  - "the delivery of health care services, where distance is a critical factor, by all healthcare professionals using ICTs
  - It fosters exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation,
  - It fosters continuing education of health care providers, all in the interests of advancing the health of individuals and their communities".

- ✓ **Cloud Computing:**

It enables on-demand access to a shared pool of computing resources

- ✓ (e.g., network, servers, storage, applications and services)

These can be dynamically provisioned and released over the Internet with minimal effort by the cloud services provider (Mell and Grance, 2011).

The key characteristics of cloud computing include:

- broad network access, On-demand provisioning, elasticity, metering, and resource pooling.
- The basic models of cloud computing are software as a service (SaaS), platform as a service (PaaS), Infrastructure as a service (IaaS).

– A combination of:
  - mobile computing,
  - cloud computing and
  - data analytics is expected to have game-changing impacts on healthcare administration, education, and research (Grindle et al., 2013).

2. The Cancer Menace

The alarming rise of cancer globally is a primary challenge to human health and development.

- Cancer is a leading cause of death worldwide accounting for 8.2 million deaths in 2012 (World Cancer Report, 2014).

- Due to growing and ageing populations, low and middle-income countries (LMICs) are largely affected, with more than 60% of cases and 70 % of deaths occurring in Africa, Asia, and Central and South America. This has given rise to the cancer-divide.

Factors Responsible for the Cancer Divide

- Cost of oncological care,
- Poor infrastructure, and
- Scarcity of medical experts such as:
  - oncologists,
  - pathologists,
  - radiation oncologists, and
  - other healthcare workers.

Some Facts on Cancer in Africa

- Cancer ailments rank among the leading causes of morbidity and mortality worldwide, with approximately 14 million new cases and 8.2 million cancer related deaths in 2012.

- The number of new cases is expected to rise by about 70% over the next 2 decades.

Some Facts Cont'd

- Among men, the 5 most common types of cancer diagnosed in 2012 were lung, prostate, colorectal, stomach, and liver cancer.

- Among women, the 5 most common types diagnosed were breast, colorectal, lung, cervix, and stomach cancer.

- More than 60% of world's total new annual cases occur in Africa, Asia and Central and South America.

- These regions account for 70% of the world's cancer deaths, more than 70% of cancer deaths occurred in low and middle-income countries (LMICs).

- Access to cancer prevention, screening, detection, diagnosis, and treatment are significant challenges in (LMICs),
  - Especially in rural areas with limited infrastructure.

Table 4: Selected Cases of Cancer in Some African Countries

S/n	Country	Population (Millions)	No. of Occurrence (Thousands)	% Risk of Cancer Before Age 75	Prevalent Cases 5 most prevalent	Leading Cancer Research Body
1	South Africa	50	77	19	✓ Prostate ✓ Breast, ✓ Cervix Uteri, ✓ Lung and ✓ Colorectum	Cancer Association of South Africa
2	Egypt	85	N/A	15	✓ Breast, ✓ Liver, ✓ Bladder, ✓ Prostate and ✓ Non-Hodgkin Lymphoma	Egyptian National Cancer Institute
3	Kenya	42	N/A	19	✓ Cervix Uteri, ✓ Breast, ✓ Prostate, ✓ Oesophagus and ✓ Kaposi Sarcoma	Kenya Medical Research Institute and Kenya Cancer Association
4	Nigeria	170	100	N/A	✓ Breast, ✓ Prostate, ✓ Cervix Uteri, ✓ Liver and ✓ Colorectum	Society of Oncology and Cancer Research of Nigeria

(Sourced from: http://globocan.iarc.fr/Pages/fact_sheets_population.aspx)

- By the year 2030, it is projected that cancer and other non-communicable diseases may overtake some infectious diseases as foremost causes of death in South Sahara Africa (SSA) (Timothy, 2013).

- It is estimated that persons in Africa have about 13% risk of getting cancer before age 75.

3. ICT Diffusion

- Table1 shows the level of diffusion of the mobile cellular subscription within the six regions of the world from the year 2010 to 2014.

- The total subscription is put at about 6.9 billion out of a total world population of about 7.3 billion (ITU, 2015).

Table 1: Mobile Cellular subscription by regions of the world

	(Millions)					(Per 100 Inhabitants)				
	2010	2011	2012	2013	2014*	2010	2011	2012	2013	2014*
Mobile-cellular subscriptions										
Africa	366	438	507	582	629	45.4	52.3	58.9	65.9	69.3
Arab States	310	349	379	399	410	87.9	99.1	105.4	108.8	109.9
Asia & Pacific	2,614	3,000	3,205	3,457	3,604	67.3	76.5	80.9	86.4	89.2
CIS	377	358	368	386	397	134.2	127.2	130.5	137.0	140.6
Europe	709	730	743	766	780	115.0	117.9	119.6	122.8	124.7
The Americas	881	952	994	1,036	1,059	94.0	100.6	103.9	107.2	108.5
Total	5257	5827	6196	6626	6879					

*Estimate. **Source:** ITU BDT Regions, see: http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx

Table 2: Internet diffusion level by regions of the world

	(Millions)					(Per 100 Inhabitants)				
	2010	2011	2012	2013	2014*	2010	2011	2012	2013	2014*
Individuals using the Internet										
Africa	79	105	125	148	172	9.8	12.6	14.6	16.8	19.0
Arab States	81	94	121	137	152	23.0	26.6	33.8	37.4	40.6
Asia & Pacific	872	988	1,113	1,205	1,310	22.5	25.2	28.1	30.1	32.4
CIS	95	115	128	143	158	34.0	40.8	45.5	50.8	55.9
Europe	410	428	443	456	467	66.6	69.2	71.4	73.1	74.8
The Americas	473	519	556	597	639	50.5	54.8	58.1	61.8	65.5
Total	2010	2249	2486	2686	2898					

*Estimate. Source: ITU BDT Regions, see: http://www.itu.int/en/ITU-D/Statistics/Pages/definitions/regions.aspx

Table 3: Mobile Telephone subscribers in some selected African Countries from 2012 - 2013

	(Millions)			(Per 100 Inhabitants)	
	2012	2013		2012	2013
Algeria	37,527,703	39,517,045		97.52	100.79
Egypt	96,798,801	99,704,976		119.92	121.51
Morocco	39,016,336	42,423,794		119.97	128.53
Mali	14,612,835	19,749,371		98.38	129.07
Nigeria	112,777,785	127,246,092		66.80	73.29
Ghana	25,618,427	28,026,482		100.99	108.19
Burkina Faso	9,976,105	11,240,886		60.61	66.38
Angola	12,785,109	13,285,198		61.41	61.87
Cameroon	13,108,058	15,664,666		60.41	70.39
Kenya	30,731,754	31,830,003		71.17	71.76
Ethiopia	20,523,889	25,646,865		22.37	27.25
Botswana	3,081726	3,246787		153.79	160.64
S/Africa	68,394,000	76,865,278		130.56	145.64
Uganda	16,356,387	16,568,786		45.00	44.09
Zimbabwe	12,613,935	13,633,167		91.91	96.35

This statistics show high prospect of mHealth within the continent.

- Mobile devices allow people to move around while maintaining access to relevant services and staying (socially) connected. This is called “Ubiquity”.
- Mobile devices provide flexibility and ubiquity.

Mobility, availability and personalization are the important values of (multimedia) mobile services (Pagani, 2004).

- Access, quality and value are the unique features of mobile technology Cocosila et. Al. (2004).
- These values have influenced the adoption of mobile devices.
- Mobile services are more popular than other Information and Communication Technology (ICT) services.

4. Mobile Technology and Mobile Services

- mTechnology refers to technology that is portable. Mobile devices, especially cell phones, represent the most common and widely used mTechnology today.

- One advantage, however, of telephones with respect to medication adherence in chronic care models is its ability to:
  - ✓ create a multi-way interaction between patient and healthcare provider(s) (Kaplan, 2006 and Cunha *et al.*, 2010).

Types of Mobile Services

- ✓ *Mobile content and information services*:
  - (maps, personalisation, and location-based services);
- ✓ *Entertainment services*:
  - (ring-tones, horoscope, mobile gaming, mobile video, and mobile music).
- ✓ *Transaction-based services*:
  - (mobile Health, bill payments, ticket bookings, reservations and mobile commerce).

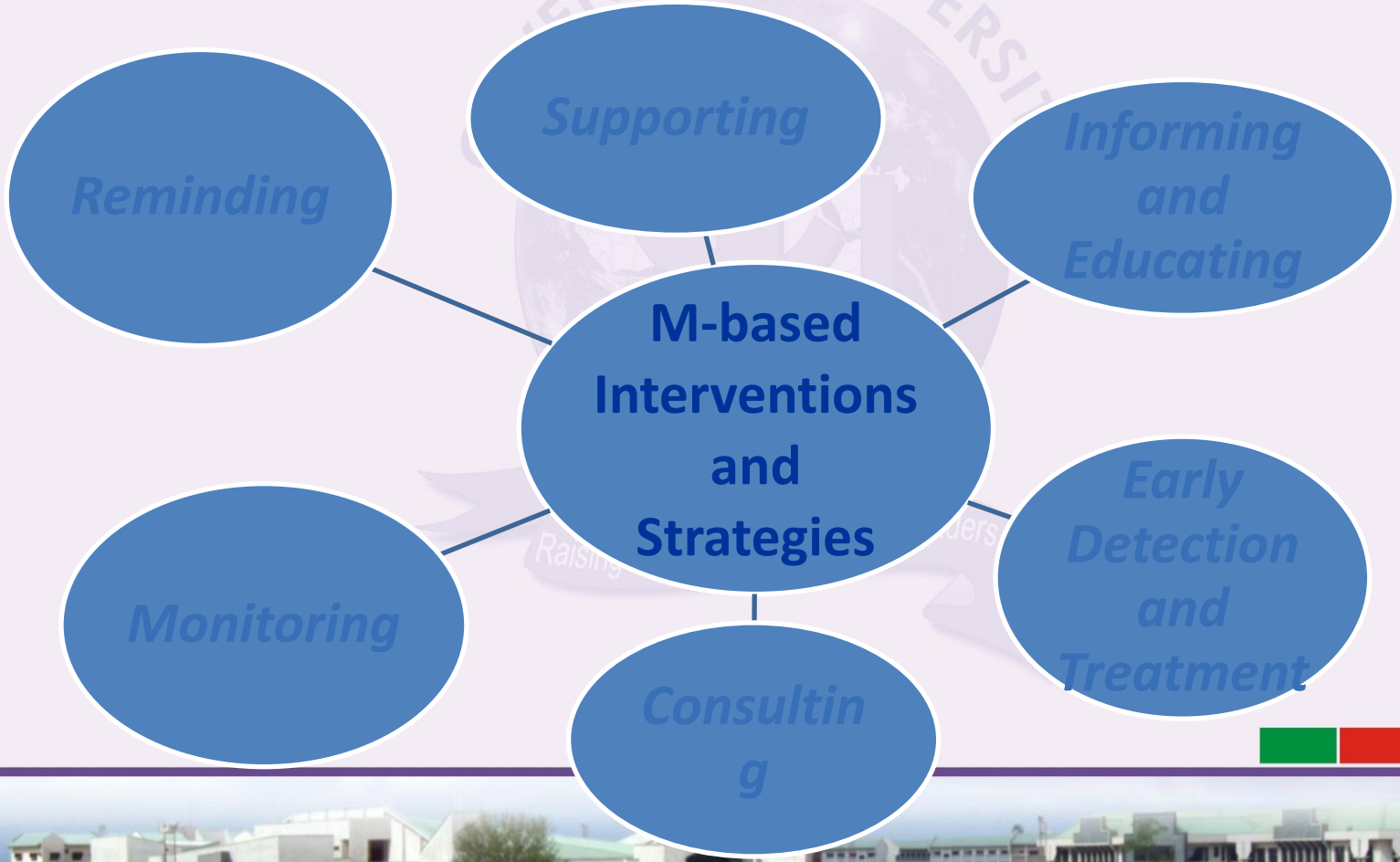
Some of Existing e-Health Initiatives

Technology	Description/Application	Country
Mobile Midwife	To deliver targeted, time-specific, evidence-based voice messages to pregnant women and new parents in their local language. Users pay for the service. SMS based.	Ghana and Nigeria
Mobile Alliance for Maternal Action (MAMA)	To provide **topic-based messages** including the prevention of mother-to-child transmission of HIV, infant feeding, and post-partum family planning. SMS based.	Bangladesh, India and South Africa
Text4Baby	To provide free text messages on parental care, baby health, parenting etc. SMS based	US
M4change	To improve quality of antenatal care services. It is SMS based.	Nigeria

e-Health Initiatives Cont'd

CliniPAK360	Provides on-demand reporting, enabling health care administrators to increase productivity and streamline the clinical experience while creating a long-term impact on patient health management.	Nigeria
Gist-A-Doctor	Offers a wide range of services—from First-aid to counseling to medical referral. A user sends SMS to complain about persistent headache	Nigeria
Project Mwana	To improve early infant diagnostics of HIV.	Zambia
Microsoft Cloud	An initiative of Microsoft and Virginia Tech to empower cancer researchers.	US
Project Masilukeke	To provide HIV/AIDS education and awareness and to encourage people to get tested	South Africa

Mobile Technology Interventions and Strategies (Required for Cancer Care)



ICT Framework for High Impact Collaboration with Africa

Policies

- Mutual Objectives
- Value Sharing
- Focussed Research/Emphasis
- Openess/information Sharing
- Evaluation and Impact Assessment

Needs

- Cancer Treatment therapies and prevention
- Data Sharing – library resources, e-journals, e-books, e-resources
- Training/Mentoring – Webinars, podcasts, videos, e-learning, visits, fellowships, exchange
- Field studies – surveys, replication studies

Tools/Enablers

- Mobile Technology – Monitoring, Disease Tracking, Detection Diagnostics, Awareness, Educating
- Infrastructure – Internet, Computers, Power, ICT infrastructure
- Video conferencing/Teleconferencing, e-consultation, virtual meeting, Tele-consulting
- Cloud Computing - data storage, data analytics, electronic health records, cancer education services

Stakeholders /Partners

- LMIC - Healthcare providers, Hospitals, Government
- LMIC - Universities, Research institutes, Researchers, Oncological /Cancer Associations
- Developed Countries - Cancer institutes, Universities, Government, International Agencies - WHO

Beneficiaries

- Patients - Improved health outcomes
- Healthcare providers - More efficient health service delivery
- LMIC Government s- efficient healthcare provision
- Institutions in Developed Countries - greater global impact

The Research Potentials in Covenant University

- Covenant University, since inception has maintained a rare commitment to investments in diverse types of resources that will encourage active collaboration with international institutions and agencies on noble initiatives that could advance the cause of African development.

Organization for Research

- Intersdisciplinary Research
- 21 established research clusters
- about 5 of them that are health-focused
- The clusters receive annual funding for research activities

Research Breakthroughs

- Product development from agricultural
- Non-fuel Powered Automobile
- e-Governance,
- Intelligent Security Systems for Crime Detection, Tracking Devices, Cooling Devices
- malaria research, and alternative low-energy

Giant strides in Bioinformatics and Biomedical Research

- Malaria research
- Tropical health issues
- Other health issues in Africa
- A strong collaboration in Prostrate cancer research
- Well equipped biotechnology labs

- **H3ABioNet** is the Bioinformatics of the H3Africa initiative
- CU – the only host in Nigeria
- H3Africa seeks to enhance the necessary genomic expertise among African Scientists and to encourage collaborations between them

Specific Achievements in ICT

- Adoption of Moodle, Google Apps for Education and Learning Management
- Unlimited Internet access to about 10,000 users via Fibre optic cables, that covers nearly the entire geography of the University.
- Acquisition of Tablets for all students: This is expected to enhance teaching/learning experience in a wireless technology environment.
- Availability of Storage area network of at least 14TB (Terabytes) on which students and faculty can store data.
- 24/7 supply of electricity.
- Deployment of infrastructure for Open and Distance learning programmes.
- Collaboration with East Carolina University's Global Academic Initiatives.
- Use of White Boards/Smart Classroom with teleconferencing and other eLearning facilities.
- Pioneering efforts on Online / e-Examination for prospect students in Nigeria and General Studies Examination

Awards based on ICT Adoption

- 2015: Ranked No 1 in Nigeria and West Africa and No 15 in Africa in 2015 Webometrics Ranking.
- 2014: Ranked No 1 in Web of Repositories in Nigeria and No 12 in Africa.
- 2014: the University won the Centenary ICT Driven University of the Year Award.

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- 2010: Best ICT Driven of the Year Award in West Africa by West Africa ICT Development Award.
- 2007, 2009: Best ICT Driven Award by ICT Africa.
- 2007: The Private University with most Improved ICT Programme and Facilities by the Commonwealth Scholarship Prize and Awards (CSPA 2007)

Recommendations and Conclusion

Specific Initiatives to foster Collaboration with Africa on Cancer

Establishing Cancer registries in Universities by collaborating directly with academic institutions

Creating capacity building opportunities in the area of telemedicine and cloud computing for health practitioners. To increase their capacity in areas of data storage and management, information security, hardware support, and healthcare data analytics.

Active engagement of (ICTs) such as mobile technology, cloud computing, social media, Internet of things, big data analytics in order to address some of the challenges faced by both developed and developing countries in providing accessible, economical and high quality health care services.

Benefits of ICT Collaration with Africa on Cancer and e-Health

- It will increase the readiness of health providers and insurers to offer flexible business models, collaborate at low cost and high speed, meet changing regulations—and deliver better patient services;
- It will shift the locus of chronic healthcare from the hospital or clinic to the home—delivering better patient care and comfort at a lower cost;
- It will help to harness and analyze health and non-health "big data" in the cloud—including social media—to improve public health through preventative well-being monitoring and encouraging healthier lifestyles;

Benefits of ICT Collaration with Africa on Cancer and e-Health

- It will help to ensure sound, personalized healthcare anywhere in the world, through ubiquitous and secure data sharing;
- It will transform access to health services in emerging markets without heavy investment in physical hospitals and clinical centres; and
- It will facilitate a low entry level for healthcare practitioners in less developed nations to share of healthcare information and resources with their colleagues in the developed nations for the purpose of improved healthcare delivery, education, and research.

Acknowledgments

- **Dr. Wilfred Ngwa**, Co-Director, Global Health Catalysts Dana Farber/Harvard Cancer Center (HCC)

- **Prof. Folakemi Odedina,** Director of University of Florida Health Cancer Center Cancer Health Disparities, University of Florida

- **Management of Covenant University**

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Thank you for Listening