

IST-Africa 2015 Conference Report

Lilongwe, Malawi

06 - 08 May 2015

Photo Copyright Malawi Tourism

Supported by



Hosted by



ISTO  *frica*

Sponsors



SKYBAND



Technical
Co-Sponsor



Introduction

IST-Africa 2015 Conference took place from 06 - 08 May 2015 in Lilongwe, as part of **IST-Africa Week 2015**. An activity of **IST-Africa**, which is supported by the European Commission and African Union Commission and co-funded under the EU Framework Programme, **IST-Africa 2015** was the tenth in an Annual Conference Series bringing together senior representatives from leading public, private, education & research organisations, to discuss ICT policy, showcase research results and share knowledge.

European research activities are structured around consecutive multi-annual programmes, or so-called Framework Programmes. Horizon 2020 sets out the Priorities and thematic areas, including ICT, for 2014 - 2020. Horizon 2020 is fully open to international co-operation with the aim to jointly address major challenges where significant added value is expected to be gained from a world-wide R&D cooperation. In this context, the European Commission has co-funded **IST-Africa** since 2005, to promote African - European research cooperation and support Information Society and ICT aspects of the Africa-EU Strategic Partnership.

Hosted by the Government of Malawi through the National Commission for Science and Technology and Technically Co-Sponsored by IEEE, **IST-Africa 2015** focused on the Role of ICT for Africa's Development and specifically on Applied ICT research in the areas of eHealth, Technology Enhanced Learning and ICT Skills, Digital Libraries, eInfrastructures, eAgriculture, Societal Implications of Technology, International Cooperation, ICT4D and eGovernment. **IST-Africa 2015** provided a collegiate setting for presentations and discussions of national & regional developments, issues of concern & good practice models, and networking with peers. **IST-Africa 2015** also provided an opportunity to identify potential partners for future proposals under Horizon 2020.

IST-Africa directly supports Information Society, Innovation and ICT aspects of the Africa-EU Strategic Partnership, the African Ministerial Council on Science and Technology (AMCOST), the Consolidated Plan of Action for the African Regional Action Plan on the Knowledge Economy (ARAPKE) and the Science, Technology and Innovation Strategy for Africa (STISA-2024).

The goals of the **IST-Africa** Conference Series are Community Building to facilitate EU-African research cooperation and successful exploitation of research results, to stimulate take-up of RTD results by industry and the public sector, to promote knowledge sharing between commercial, government and research organisations, to exchange experiences about the current state of eAdoption at a sectoral, national or regional level, and to support International Cooperation and open up the European Research Area (ERA) to Africa.

Participants at IST-Africa 2015

IST-Africa 2015 Conference attracted over 400 delegates from 39 countries representing policy makers, practitioners, and researchers from leading commercial, government and research organisations around the world. Unlike many research conferences, **IST-Africa** provided an opportunity to meet with senior managers, practitioners, project managers, software engineers and researchers from industry, government and research organisations. Delegates and speakers attended to share knowledge, experience and lessons learnt, and network with their peers from around the world.

IST-Africa 2015 Conference also provided the unique opportunity to identify partners and opportunities to co-operate in international ICT research projects co-funded by the European Commission under Horizon 2020. Much of the European research results presented in this year's conference were co-funded under the FP7 ICT Programme (2007 - 2013).

The Venue

IST-Africa 2015 Conference took place in Bingu International Conference Centre, Lilongwe.

The Programme

The 3-day programme featured an invigorating mix of business and government case studies, technical and policy papers and interactive workshops. As well as opening and closing plenary sessions, delegates participated in 33 thematically focused parallel sessions featuring different aspects of International Cooperation, ICT4D, eHealth, eInfrastructures, Technology Enhanced Learning and ICT Skills, Digital Libraries, Mobile Applications, ICT for Environmental Sustainability and eAgriculture, Cyber Security, Societal Implications of Technology and eGovernment. Session Chairs ensured active discussion and facilitated delegate participation.

In the context of focusing on the Role of ICT for Africa's Development, the Opening Plenary on Wednesday 06 May featured a high level dialogue on Implementation of the Information Society in Africa. The Closing Plenary on Friday 08 May focused on Innovation and Research Capacity Building in Malawi.

Horizon 2020

Horizon 2020 commenced in January 2014 as the new Framework Programme to implement the Innovation Union with research and innovation funds of €80 billion from 2014 - 2020.

Three main priorities include:

- Excellence Science – Research Infrastructures, Marie Curie (Mobility Grants), Future and Emerging Technologies
- Leadership in Enabling and Industrial Technologies (LEIT) – Components & Systems, Advanced Computing, Future Internet, Content Technologies and Information Management, Robotics, Micro and Nano-electronics and photonics
- Societal Challenges – Health, Food Security & Agriculture, Energy, Transport, Climate action and Environment, Innovation and Reflective Societies and Secure Societies

Updated Work Programmes for 2015 for each thematic area were published on July 2014.

ICT is a horizontal activity that is included across a number of Work Programmes within LEIT and within Societal Challenges.

The IST-Africa Guide to 2015 Calls for Proposals within Horizon 2020 provides an overview of Calls, themes and deadlines within the Marie Curie, eInfrastructures, Leadership in Enabling and Industrial Technologies and each of the Societal Work Programmes.

Please visit

www.ist-africa.org/home/default.asp?page=horizon2020

to download the individual Work Programmes and IST-Africa Guide to 2015 Calls for Proposals

Living Labs Workshop, 05 May

The fifth IST-Africa Annual Living Lab Thematic Working Group Meeting on Tuesday 05 May 2015 focused on issues related to mHealth and ICT Entrepreneurship with more than 60 delegates from Africa and Europe.

This workshop facilitated knowledge sharing and collaboration between Innovation Stakeholders and operators of Living Labs and Innovation Spaces, building on progress achieved at previous Working Group Meetings in Mauritius (2014), Nairobi (2013), Dar es Salaam (2012) and Gaborone (2011). It introduced the concepts of Living Labs methodologies in Malawi. It demonstrated how Living Lab methodologies can be used to support Action Research and encourage greater Innovation cooperation between end user communities and public, private, Higher Education Institutions and NGOs.

Conference Proceedings

The **IST-Africa 2015** conference proceedings was published on CD-ROM and on the Conference Portal. Each delegate received a free copy of the conference proceedings in their conference pack.

All members of the IST-Africa Community have open access to the IST-Africa Conference Proceedings from 2006 on the IST-Africa portal.

The **IST-Africa 2015** Conference Proceedings was also submitted for publication in IEEE Xplore.

Support Organisations

IST-Africa 2015 was hosted by the Government of Malawi through National Commission for Science and Technology. Support organisations included MACRA who kindly provided the conference dinner, Skyband who provided internet access and MTL who provided communication support. **IST-Africa 2015** was technically co-sponsored by IEEE Region 8, IEEE Social Implications of Technology and IEEE South Africa Section.

IST-Africa Initiative

Supported by the European Commission (EC) and African Union Commission (AUC), and Co-Funded under FP7 (Contract 611795), **IST-Africa** facilitates and supports:

- International Innovation, Research and Policy Cooperation
- Knowledge Sharing and Skills Transfer between IST-Africa Partners
- Collaborative Innovation, Entrepreneurship & Adoption of Living Labs
- Africa – EU Strategic Partnership (Information Society, ICT, Innovation)

IST-Africa is a collaborative initiative between IIMC International Information Management Corporation Limited (Ireland, Coordinator), Ministerio da Ciencia e Tecnologia (Angola), Department of Science and Technology (South Africa), Ministry of Infrastructure, Science and Technology (Botswana), Ministry of Communications, Science and Technology (Lesotho), Ministry of Education (Namibia), ICT Policy Implementation Technical Unit (Mozambique), National Computer Board (Mauritius), Ministry of Information Communication Technology (Swaziland), National Commission for Science and Technology (Malawi), COSTECH - Tanzania Commission for Science and Technology, Uganda National Council for Science and Technology, Ministry of Higher Education, Science and Technology (Kenya), Ministère de l'Enseignement Supérieur et de la Recherche Scientifique (Burundi), Ministry of Science and Technology (Ethiopia), Agence Nationale des Technologies de l'Information et de la Communication (Cameroon), Ministère de l'Enseignement Supérieur, des Universités et de la Recherche (Senegal), Ministère de l'Enseignement Supérieur et de la Recherche Scientifique (Tunisia) and Information Technology Industry Development Agency (Egypt).

Plenary Session Speakers



Hon. Emmanuel Fabiano
Minister of Education, Science
and Technology, Malawi



Mrs Lonely Magreta
Permanent Secretary for
Education, Science and
Technology, Malawi



Mr Anthony Muyepa-Phiri
Director General,
NCST, Malawi



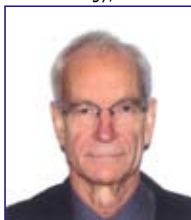
Mr Andrew Kumbatira
Director General,
MACRA, Malawi



Mr Victor Malewa
Deputy Director
eGovernment Dept.



Dr Paulos Nyirenda
CEO
SDNP



Mr Morten Møller
DG CONNECT
European Commission



Dr Harry Gombachika
CEO
Malawi Telecommunications



Dr Pascal Hoba
CEO
UbuntuNet Alliance



Mrs Bessie Nyirenda
Management Consultant
Malawi Institute of Management

Plenary Speakers included:

- **Hon. Dr. Emmanuel Fabiano, M.P.**, Minister of Education, Science and Technology, Malawi
- **Mrs Lonely Magreta**, Permanent Secretary for Education, Science and Technology, Malawi
- **Mr Anthony Muyepa-Phiri**, Director General, National Commission for Science and Technology, Malawi
- **Mr Andrew Kumbatira**, Director General, Malawi Communications Regulatory Authority
- **Mr Victor Malewa**, Deputy Director, Department of e-Government, Ministry of Information
- **Ms Souhila Amazouz**, Infrastructure and Energy Department, African Union Commission
- **Mr Morten Møller**, Programme Coordination, DG CONNECT, European Commission, Belgium
- **Dr Harry Gombachika**, Chief Executive Officer, MTL
- **Dr Pascal Hoba**, CEO, UbuntuNet Alliance
- **Dr. Paulos Nyirenda**, CEO, SDNP
- **Mrs Bessie Nyirenda**, Management Consultant, Malawi Institute of Management
- **Prof. John D. Kalenga Saka**, Vice Chancellor, University of Malawi
- **Dr. Robert Ridley**, Vice Chancellor, Mzuzu University
- **Prof. George Kanyama Phiri**, Vice Chancellor, LUANAR
- **Martin B. Thawani**, Malawi University of Science and Technology
- **Dr Charles Mwansambo**, Principal Secretary, Ministry of Health
- **Stella Kamkwamba**, Director of Agriculture Extension Services, Ministry of Agriculture and Food Security

International Programme Committee

A distinguished Programme Committee has been formed to review and provide feedback on papers and presentations, and chair sessions.

The **IST-Africa 2015** International Programme Committee includes

- **Paul Cunningham** (Conference Chair), IIMC International Information Management Corporation Ltd, Ireland
- **Tiwonge Msulira Banda**, Ubuntunet Alliance, Malawi
- **Laurens Cloete**, Meraka Institute, CSIR, South Africa
- **Miriam Cunningham**, IIMC International Information Management Corporation Ltd, Ireland
- **Kim Davis**, Research Council of Norway, Norway
- **Prof. Love Ekenberg**, DSV, University of Stockholm, Sweden
- **Dr. Mike Joy**, University of Warwick, United Kingdom
- **Dr. Chipo Kanjo**, Department of Computer Science, Chancellor College, University of Malawi, Malawi
- **Mr. Gift Khangamwa**, Computing & IT Department, The Polytechnic, University of Malawi, Malawi
- **Vasilis Koulolias**, eGovLab, Stockholm University, Sweden
- **Kristiina Lahde**, TANZICT Programme, Tanzania
- **Prof. Maurice Mars**, University of KwaZulu-Natal, South Africa
- **Alinafe Mbendera**, Lilongwe University of Agriculture and Natural Resources, Malawi
- **Dr. Chomora Mikeka**, Department of Physics, Chancellor College, University of Malawi, Malawi
- **Lloyd Momba**, Director of Telecommunications, Malawi Communications Regulatory Authority, Malawi
- **Anthony Muyepa**, DG, National Commission for Science and Technology, Malawi
- **Loi Namugenyi**, Uganda National Council for Science & Technology, Uganda
- **Seyani Nayeja**, Director of ICT, Mzuzu University, Malawi
- **Mrs Bessie Nyirenda**, Malawi Institute of Management, Malawi
- **Dr. Sue Pendell**, Colorado State University, United States
- **Sameerchand Pudaruth**, University of Mauritius, Mauritius
- **Matti Sinko**, Finland

- **Bernard Stevenot**, SpaceBel, Belgium
- **Richard Stevens**, Stevens Consultants, Italy
- **Dr Marita Turpin**, Department of Informatics, University of Pretoria, South Africa
- **Prof. Darelle Van Greunen**, Nelson Mandela Metropolitan University/LLISA, South Africa

Organising Committee

- **Miriam Cunningham**, IIMC, Ireland
- **Paul Cunningham**, IIMC, Ireland
- **Gift Kadzamira**, National Commission for Science and Technology, Malawi
- **Ebony Msikawanthu**, National Commission for Science and Technology, Malawi



Conference Secretariat

IIMC Ltd
13 Docklands Innovation Park, 128 East Wall Road,
Dublin 3, Ireland
Tel: +353 (0) 1 8170607, Fax: +353 (0) 1 8170606
e-mail: secretariat@IST-Africa.org
www.IST-Africa.org/Conference2015



Wednesday, May 06, 2015

08:00

Registration

09:00 Opening Plenary 1a: [Opening Plenary](#)**Opening Remarks**

Anthony Muyepa-Phiri, Director General, National Commission for Science and Technology, Malawi

European Commission Address

Morten Møller, Programme Coordination, DG CONNECT, European Commission, Belgium

African Union Commission Address

Souhila Amazouz, African Union Commission, Ethiopia

Welcome Address

Lonely Magreta, Permanent Secretary for Education, Science and Technology, Malawi

Official Opening Speech

Hon. Emmanuel Fabiano, M.P., Minister of Education, Science and Technology, Malawi

10:30

Coffee Break

11:00 Plenary Session 2a: [High-level Roundtable on Implementation of the Information Society in Africa](#)

Moderator: [Paul Cunningham, IIMC, Ireland](#)

Lonely Magreta, Permanent Secretary for Education, Science and Technology

Anthony Muyepa-Phiri, Director General, NCST / CTO MAREN

Andrew Kumbatira, Director General, Malawi Communications Regulatory Authority (MACRA)

Victor Malewa, Deputy Director, Department of e-Government, Ministry of Information

Souhila Amazouz, Senior Policy Officer, Infrastructure and Energy Department, African Union Commission

Dr Pascal Hoba, CEO, UbuntuNet Alliance

Dr Harry Gombachika, Chief Executive Officer, Malawi Telecommunications Limited

Dr Paulos Nyirenda, CEO, SDNP

Bessie Nyirenda, Management Consultant, Malawi Institute of Management

12:30

Lunch

14:00 Workshop 3a: [IST-Africa - Research Capacities & Priorities I](#)

Chair: [Paul Cunningham, IIMC, Ireland](#)

ICT Initiatives and Research Capacity in Malawi

Gift Kadzamia, National Commission for Science and Technology, Malawi

ICT Initiatives and Research Capacity in Mozambique

Zauria Saifodine, National Institute for ICT, Mozambique

ICT Initiatives and Research Capacity in Namibia

Ebenhezer Kauhonina, National Commission on Research, Science and Technology, Namibia

ICT Initiatives and Research Capacity in Botswana

Phodiso Potesh Phole, Ministry of Transport and Communications, Botswana

ICT Initiatives and Research Capacity in South Africa

Peacemaker Dlamini, Department of Science and Technology, South Africa

ICT Initiatives and Research Capacity in Mauritius

Iqbal Agowun, National Computer Board, Mauritius

14:00 Session 3b: [eHealth I](#)

Chair: [Chipo Kanjo, University of Malawi, Chancellor College](#)

Towards an ICT Framework to Support a Patient-Centric**Approach in Public Healthcare: A Case Study of Malawi**

Richard Pankomera, Nelson Mandela Metropolitan University, South Africa

Practicing Evidence-Based Medicine in Developing Countries

Juha Puustjärvi, University of Helsinki, Finland

An Approach for a National eHealth Implementation – the Case of Modular Interactive Tiles for Rehabilitation

Henrik Hautop Lund, Technical University of Denmark, Denmark

SIEMA: A System to Improve the Access to Medical Emergency Services

Mateus Calado, Faculdade de Ciências - Universidade Agostinho Neto, Angola

14:00 Session 3c: [Technology-enhanced Learning I](#)

Chair: [Gift Khangamwa, The Polytechnic, University of Malawi](#)

Evaluating Preparedness for Social Networks Integration into Learning: A Case Study of Inoorero University

Elyjoy Micheni, The Technical University of Kenya, Kenya

Social Media in Higher Learning: Is it a tool for Social or Academic Purpose? A Comparative Study between MoCU, Tanzania and LUNAR, Malawi

George Matto, Moshi Co-operative University, Tanzania

Gamifying a PhD Taught Module: A Journey to Phobos and Deimos

Laurie Butgereit, Nelson Mandela Metropolitan University, South Africa

14:00 Session 3d: [eGovernment I](#)

Chair: [Bessie Nyirenda, Malawi Institute of Management](#)

E-identity: Basic Building Block of e-Government

Jiri Prusa, CZ.NIC Association, Czech Republic

Methodology for Improving Data Quality Management in South African Government Departments

Stanley Ndivhuho Malange, Tshwane University of Technology, South Africa

A Structural Equation Model for Data Warehouse Adoption in a Government Department

Edzai Kademeteme, Tshwane University of Technology, South Africa

Mobile Visualisation Techniques for Large Datasets

Ingrid Sieborger, Rhodes University, South Africa

15:30

Coffee Break

16:00 Workshop 4a: [IST-Africa - Research Capacities & Priorities II](#)

Chair: [Paul Cunningham, IIMC, Ireland](#)

Defining Joint EU-Africa Priorities – An Opportunity for ICT Collaboration?

Stephane Hogan, European Commission, Ethiopia

ICT Initiatives and Research Capacity in Lesotho

Lieketseng Tjokotsi, Department of Science and Technology, Lesotho

ICT Initiatives and Research Capacity in Tunisia

Noureddine Hamdi, Ministère de l'Enseignement Supérieur et de la Recherche Scientifique, Tunisia

ICT Initiatives and Research Capacity in Egypt

Haitham Hamza, Information Technology Industry Development Agency (ITIDA), Egypt

ICT Initiatives and Research Capacity in Senegal

Toumane Doumbouya, Ministère de l'Enseignement Supérieur et de la Recherche, Senegal

16:00 Session 4b: **eHealth II**

Chair: **Seyani Nayeja, Mzuzu University, Malawi**

The Development of an e-Health System for Health Awareness Campaigns in Poor Areas

Chikumbutso Gremu, Office of the Vice President, Malawi

Mobile Health App to Improve the Quality of Care in Community Case Management in Malawi

Chris Kulanga, D-tree International, Malawi

Use of Data Mining to Check the Prevalence of Prostate Cancer: Case of Nairobi County

Njeri Ngaruiya, University of Nairobi, Kenya

Nationwide Health Education Using Mobile Technology

Sam Kampondeni, Moyo Wanga Private Clinic, Malawi

16:00 Session 4c: **Technology-enhanced Learning II**

Chair: **Kristiina Lahde, TanzICT Programme, Tanzania**

Transforming Africa into a Knowledge-based society: Concretizing the case for Digital Literacies and Revision of ICT Strategies in the Education Sector in the Region

Joseph M. Kavulya, The Catholic University of Eastern Africa, Kenya

e-Education Adoption in Emerging Economy Countries: Case of Malawi

Marian Mtingwi, Department of eGovernment, Malawi

Mobile E-Learning: The Choice between Responsive/Mobile Websites and Mobile Applications for Virtual Learning Environments for increasing access to Higher Education in Malawi

Chifundo Chilivumbo, The University of Malawi: The Polytechnic, Malawi

Support Given to Lecturers when Providing Mobile Centric Services in Teaching and Learning: A Policy Analysis Perspective

Baldreck Chipangura, Unisa, South Africa

16:00 Session 4d: **eGovernment II**

Chair: **Vasilis Koulolias, eGovlab, Sweden**

Mobile Government in African Least Developed Countries (LDCs): Proposed Implementing Framework

John Mtingwi, Office of the President and Cabinet, Malawi

Using Mobile Phones for Public Participation with Local Government in Cape Town

Jean-Paul Van Belle, University of Cape Town, South Africa

Citizen-Centric Critical Success Factors for the Implementation of E-government: A Case Study of Kenya Huduma Centers

Ibrahim Otieno, University of Nairobi, Kenya

Towards Addressing the Requirements for Coordination in the Distributed South African Public Sector from a Virtual Community-Centric Collaboration Process Lifecycle Perspective

Godwin Thomas, Nelson Mandela Metropolitan University, South Africa

17:30

End of Parallel Sessions



Thursday,
May 07, 2015

09:00 Workshop 5a: **IST-Africa - Research Capacities & Priorities III**

Chair: **Paul Cunningham, IIMC, Ireland**

ICT Initiatives and Research Capacity in Cameroon

Njei Check, National Agency for Information and Communication Technologies (ANTIC), Cameroon

ICT Initiatives and Research Capacity in Kenya

Jacob Njagih, Ministry of Education, Science and Technology, Kenya

ICT Initiatives and Research Capacity in Uganda

Loi Namugenyi, Uganda National Council for Science & Technology, Uganda

ICT Initiatives and Research Capacity in Burundi

Augustin Nsabyumva, Ministry of Higher Education and Scientific Research, Burundi

ICT Initiatives and Research Capacity in Tanzania

Mauridi Abubakari, COSTECH, Tanzania

ICT Initiatives and Research Capacity in Ethiopia

Leulseged Alemie, Ministry of Communications and Information Technology, Ethiopia

09:00 Session 5b: **eHealth - Health Information Systems I**

Chair: **Darelle Van Greunen, Nelson Mandela Metropolitan University, South Africa**

Developing Capacity for Maintenance of HIS in the Context of Loosely Coordinated Project Support Arrangements

Tiwonge Manda, University of Malawi, Chancellor College, Malawi

A Framework for the Acceptance Process of District Health Information System for Vertical Health Programmes

Achilles Kiwanuka, Health Marc Limited, Uganda

From User Training Courses and Central Support to Creating Local User Competence for Mentoring Colleagues: A Preliminary Study in Malawi

Ellen Bjoerge, University of Oslo, Norway

09:00 Session 5c: **Technology Enhanced Learning III**

Chair: **Noureddine Hamdi, Ministere de l'Enseignement Supérieur et de la Recherche Scientifique, Tunisia**

Using TV White Spaces and e-Learning in South African Rural Schools

Albert Lysko, Meraka Institute (CSIR), South Africa

Knowledge Sharing Framework for Educators in Southern Africa: A Case Study of Secondary Schools in Tshwane South District

Lovemore Motsi, Tshwane University of Technology, South Africa

The Integration of ICTs into the Learning Activities of the College of Medicine Undergraduate Students

Felix Majawa, Mzuzu University, Malawi

A Preliminary Classification of eLearning Models

Zebiba Abegaz, Wollo University, Ethiopia

09:00 Session 5d: **eGovernment III**

Chair: **Zauria Saifodine, National Institute for ICT, Mozambique**

An Exploration of Critical Success Factors for e-Governance Project Initiation: A Preliminary Framework

Sylvester Hatsu, Accra Polytechnic, Ghana

Assessing Benefits and Impact Creation in IST Research Projects

Kim Jansson, Technical Research Centre of Finland VTT Ltd., Finland

Evaluating the Public Value of E-government Services

Gabriel Kamau, Murang'a University College, Kenya

09:00 Workshop 5e: **Identity Federation and Shared Services for Research and Education**

Chair: **Omo Oaiya, WACREN, Nigeria**

Overview of Identity Federation and Shared Services – A Global Perspective

Sabine Jaume-Rajaonia, CIRAD, France

Status of Identity Federations in Africa

Tiwonge Msulira Banda, UbuntuNet Alliance for Research and Education Networking, Malawi

Service Providers, Shared Services and NREN Clouds

Ognjen Prnjat, GRNET S.A, Greece

Panel discussion - Panelists include:

Joseph Kimaili (UbuntuNet Alliance), Boubakar Barry (WACREN), Bruce Becker (SAGrid), DamienAlline (IRD), Carmen-GloriaLabbe (RedCLARA)

10:30 Coffee Break

11:00 Session 6a: **ICT4D**

Chair: **Haitham Hamza, Information Technology Industry Development Agency (ITIDA), Egypt**

Knowledge Sharing in Africa: Perspectives on the Future
Jon Gregson, Development Dreamers Ltd, United Kingdom

Designing for Sustainability: Involving Communities in Developing ICT Interventions to Support Water Resource Management

Fiona Ssozi - Mugarura, University of Cape Town, South Africa

Towards a Sustainability Criteria Model for ICT4D Projects and Living Labs Initiatives: A Siyakhula Living Lab Observation
Shadreck Mudziwepasi, Siyakhula Living Lab Project, South Africa

How Lessons Learnt informed the Development of an Implementation Framework in an ICT4D Initiative
Marlien Herselman, Meraka Institute, CSIR, South Africa

A Lightweight Mobile E-Procurement Solution for Rural Small Scale Traders Implemented Using a Living Lab Approach
Felix Ntawanga, University of South Africa, South Africa

11:00 Session 6b: **eHealth - Health Information Systems II**

Chair: **Jacob Njagih, Ministry of Education, Science and Technology, Kenya**

A Demographics Data Exchange for Continuity of Care: Is it Feasible in Low-Resource Settings?

Ronald Manjomo, Baobab Health Trust, Malawi

Strengthening Health Management Information Systems in Malawi: Gaps and Opportunities

Maganizo Monawe, I-TECH Malawi, Malawi

A Socio-Technical Approach to Understanding Data Quality in Health Information Systems: Data Quality Intervention in Kenya
Ayub Many, Ministry of Health, Kenya

Applications of Data Mining in the Health Sector in Lesotho: A Preliminary Study
Lebeko Poulo, Limkokwing University of Creative Technology, Lesotho

11:00 Session 6c: **Technology Enhanced Learning IV**

Chair: **Lieketseng Tjokotsi, Department of Science and Technology, Lesotho**

An Internet Mediated PhD Program in Computer Science and Information Technology

Izzeldin Osman, Sudan University of Science and Technology, Sudan

Sentiment Analysis of the ICT4Rural Education Teacher Professional Development Course

Coral Featherstone, Meraka Institute, South Africa

MOOCs for Pre-Service Teachers: Their Notions of 21st Century Learning Design

Jameson Goto, University of Johannesburg, South Africa

Cultivating Lifelong Learning: Pre-Service Teachers and their MOOCs

Jacqueline Batchelor, University of Johannesburg, South Africa

11:00 Session 6d: **eGovernment IV**

Chair: **Peacemaker Dlamini, Department of Science and Technology, South Africa**

The Value of Information - Assessing ICT requirements in Local Government

Bianca Forlee, University of Cape Town, South Africa

College Electronic Voting Environment (CEVE)

Emily Bagarukayo, Makerere University, Uganda

Local procurement in Mozambique: the case of InBid

Albertina Oliveira, Pandora Box, Lda., Mozambique

11:00 Workshop 6e: **Synergy for Global Collaboration in Science Powered by R&E networks**

Chair: **Boubakar Barry, WACREN, Senegal**

TANDEM - Strengthening the WACREN Community and Promoting Global Research Collaboration

Damien Alline, IRD, France

Sci-GaIA - The next iteration of Infrastructure and Services for e-Science in Africa

Bruce Becker, Meraka Institute, CSIR, South Africa

MAGIC - Collaboration Tools and Agreements for Global Communities

Carmen Gloria Labbe, RedCLARA, Chile

12:30 Lunch

14:00 Workshop 7a: **Impact Assessment of ICT4D projects**

Facilitators: **Darelle van Greunen & Alida Veldsman, Nelson Mandela Metropolitan University, South Africa**

Introduction

Impact Assessment Terms

Definition of Impact Assessment

When to do an Impact Assessment

Impact Assessment Overview

Types and Combination of Impact Assessments Methods

Practical exercise focussing on a specific intervention

14:00 Workshop 7b: **Supporting Life**

Chair: **Seyani Nayeja, Mzuzu University, Malawi, Joseph Wu, Luke International, Malawi**

An Assessment on the Impact of introducing Electronic based Community Case Management (e-CCM) over paper based Community Case Management in the Management of Childhood Illnesses in Rural Northern Malawi

Griphyn Baxter Chirambo, Mzuzu University, Malawi

Applying WHO guideline for National Health Information System Architecture Design to Malawi - from Community to Globe

Joseph Wu, Luke International, Malawi

Designing an electronic Community Case Management decision aid for the management of childhood illnesses in village clinics in Malawi- a demo of Supporting LIFE application

Jenny Hsieh, Luke International, Malawi

A Blueprint for Integrated Community Disease Management and Surveillance through the Use of eHealth Applications

Duke Caesar, Luke International, Malawi

14:00 Session 7c: **Technology Enhanced Learning V**

Chair: **Alinafe Mbendera, LUANAR, Malawi**

Preparing Teachers to Integrate Tablet Computers into Teaching and Learning

Eunice Eytayo Olakanmi, University of Johannesburg, South Africa

Use of Tablets in Blended Learning: A Case Study of an Institution of Higher Learning in Kenya

Elizaphan Maina, Kenyatta University, Kenya

Student's Experiences in Using Chat Rooms as Virtual Classrooms: A Case of Kenyatta University Distant Learning Students

Rhoda Gitonga, Kenyatta University, Kenya

Heuristics for Evaluating Usability of Learning Management Systems in Africa

Joel Mtebe, University of Dar es Salaam, Tanzania, Tanzania

14:00 Session 7d: **Regulatory Frameworks**

Chair: **Francis Bisika, Malawi Communications Regulatory Authority, Malawi**

Supporting Regulators in becoming more beneficial for society
Nils Jensen, Stockholm University, Sweden

On Bringing Governance into Technology: Case of Internet Governance and Implications for Africa

Chipo Kanjo, University of Malawi, Chancellor College, Malawi

Good Corporate Governance of ICT in Municipalities
Petrus Delpont, Nelson Mandela Metropolitan University, South Africa
Improved Service Continuity in Municipalities
Ruan Koen, Nelson Mandela Metropolitan University, South Africa

15:30

Coffee Break

16:00 Workshop 8a: **ICT Initiatives in Malawi**

Chair: **Anthony Muyepa-Phiri, Director General, National Commission for Science and Technology, Malawi**

Regulatory Initiatives to Increase ICT Penetration in Malawi
Francis Bisika, Malawi Communications Regulatory Authority, Malawi
Software Defined Radios and Internet Independent Broadband Links Using Tailor-Made Android Apps
Stanley Mlatho, Chancellor College - University of Malawi, Malawi
Overview of Digital Migration in Malawi
Denis Chirwa, Ministry of Information, Tourism & Culture, Malawi
eInfrastructure Development for Malawi
Chimwemwe Khonje, Malawi Telecommunication Limited, Malawi
Enabling eHealth in Resource Constrained Settings
Oliver Gadabu, Baobab Health Trust, Malawi
Leveraging ICT Initiatives for Development in Africa
Thandikile Mvundula, Nico Technologies, Malawi

16:00 Session 8b: **mHealth**

Chair: **Iqbal Agowun, National Computer Board, Mauritius**

A Model for Mobile Phone Adoption in Maternal Healthcare
Gilbert Maiga, Makerere University, Uganda
Leveraging Health through Early Warning Systems Using Mobile and Service Oriented Technology
Silvester Namuye, USIU, Kenya
Assessing the Use of Mobile Technology to improve Timeliness of HMIS Reports in Malawi
Christon Moyo, Ministry of Health, Malawi
Re-engineering School Healthcare Services Using Mobile Technologies, in the Eastern Cape
Darelle Van Greunen, Nelson Mandela Metropolitan University, South Africa
Adoption and Use of mHealth System for Livestock Farmers in Karura village in Kenya
David Gichoya, Moi University, Kenya

16:00 Workshop 8c: **Mobile GraphoGame Solution to Global Illiteracy Crisis**

Chair: **Heikki Lyytinen, University of Jyväskylä, Finland**

GraphoWorld Solution to Global Illiteracy Crisis
Heikki Lyytinen, University of Jyväskylä, Finland
Mobile Solution for Better Reading Instruction in Rural Africa
Christopher Kyakukaisha Yalukanda, Zambia National Union of Teachers/University of Jyväskylä, Zambia
Ensuring Sufficient Literacy Practice with Tablet Technology in Zambian Schools
Gabriel Walubita, University of Zambia, Zambia

16:00 Session 8d: **Cyber Security**

Chair: **Njei Check, National Agency for Information and Communication Technologies (ANTIC), Cameroon**

Improving South Africa's Cyber Security by Cyber Securing its Small Companies
Basie von Solms, University of Johannesburg, South Africa
Digital Forensics in the Cloud: The State of the Art
George Sibiya, CSIR, South Africa
Digital Forensic Readiness for Branchless Banking
Yusuf Mitha, University of Pretoria, South Africa
Better Information Security Management in Municipalities
Joshua de Lange, Nelson Mandela Metropolitan University, South Africa
An Integrated Internet of Things Based System for Tracking and Monitoring Assets – the case of the Central University of Technology
Muthoni Masinde, Central University of Technology, South Africa

17:30

End of Parallel Sessions



Friday,
May 08, 2015

09:00 Session 9a: **eAgriculture**

Chair: **Loi Namugenyi, Uganda National Council for Science & Technology, Uganda**

Electronic Voucher System: Leveraging Efficiency in Farm Input Subsidy Programme Implementation
Chrispin Namwera, African Institute of Corporate Citizenship, Malawi
Utilization of ICT for Agriculture: A Case Study of Kakamega County, Kenya
Moses Thiga, Kabarak University, Kenya
Bioacoustic Approaches to Biodiversity Monitoring and Conservation in Kenya
Ciira Maina, Dedan Kimathi University of Technology, Kenya

09:00 Session 9b: **ICT Supporting Innovation**

Chair: **Leulseged Alemie, Ministry of Communications and Information Technology, Ethiopia**

Rethinking Girl Data: The Girl Impact Map
Kecia Bertermann, Girl Hub Rwanda, Rwanda
Leveraging FIWARE to Develop Innovative Applications
Pierre-Yves Danet, Orange Labs, France
Business Process Adoption in Organisations: A Case Study from an Insurance Company in South Africa
Judy Van Biljon, University of South Africa, South Africa
The Adoption of Crowdsourcing Platforms in South Africa
Jabu Mtsweni, CSIR, South Africa

09:00 Session 9c: **Digital Libraries**

Chair: **Gift Kadzamira, National Commission for Science and Technology, Malawi**

Physical Security Measures for Computer-Based Information Systems: a Case Study of Selected Academic Libraries in Kenya
Rose Njoroge, Kenyatta University, Kenya
Design of an Open ICT4D Knowledge Repository
Melanie Platz, University of Koblenz Landau, Campus Landau, Germany
Utilization of Digital Spaces in Information Management Work - A Case of Kenya Human Rights Commission Resource Centre
Grace Were, Kenya Human Rights Commission, Kenya

09:00 Session 9d: **eInfrastructures**

Chair: **Tiwonge Msulira Banda, UbuntuNet Alliance for Research and Education Networking, Malawi**

Enabling Intercontinental e-Infrastructures – a Case for Africa
Ognjen Prnjat, GRNET S.A, Greece
Surveying Clouds in a Global Environment
Bruce Becker, Meraka Institute, CSIR, South Africa
eInfrastructure: Next Generation Wireless Broadband Networks for Uganda 2020
Geoffrey Mark Kagarura, Makerere University, Uganda
Modeling the Exposure of Services within Next Generation Telecommunication Networks
Mosiuoa Tsietsi, Rhodes University, South Africa
Design of a Low Cost Television White Space Z Antenna
Jonathan Pinifolo, Malawi Communications Regulatory Authority, Malawi

10:30

Coffee Break

11:00 Session 10a: eAgriculture & Environmental Sustainability

Chair: **Ebony Msikawanthu, National Commission for Science and Technology, Malawi**

Heterogeneous Wireless Network Based on Wi-Fi and ZigBee for Cattle Monitoring

Patrick Nkwari, University of Johannesburg, South Africa

Scientific Verification of Weather Lore for Drought Forecasting – The Role of Fuzzy Cognitive Mapping

Solomon Mwagha, Central University of Technology, South Africa

Weather Observation via Stratospheric Platform Stations

Sihle Sibiyi, Durban University of Technology, South Africa

11:00 Session 10b: eInclusion

Chair: **Ebenhezer Kauhonina, National Commission on Research, Science and Technology, Namibia**

Factors Determining Digital Divide in Ghana's Basic Schools

James Sunney Quaiocoe, Tallinn University, Estonia

Rethinking Network Connectivity in Rural Communities in Cameroon

Jean Louis Fendji Kedieng Ebongue, University of Ngaoundéré, Cameroon

The e-Services Provisioning as Part of the Millennium Developmental Goals (MDGs): Initiative of Addressing Digital Divide in Rural and Marginalized Communities

Mfundo Shakes Scott, University of Fort Hare, South Africa

An Analysis of Current ICT Trends for Sustainable Strategic Plan for Southern Africa

Nobert Jere, Polytechnic of Namibia, Namibia

11:00 Session 10c: Next Generation Computing

Chair: **Jonathan Pinifolo, Malawi Communications Regulatory Authority, Malawi**

Social Things: Now We Can

Bruno Apolloni, University of Milano - Italy, Italy

A Maker-Community-Friendly Implementation of a Smart and Green Office Environment: Lessons Learned

Andrew Cyrus Smith, CSIR Meraka Institute, South Africa

A Conceptual Framework for Cloud-Computing Management: An End-user Environment Perspective

Likhwa Mlotshwa, University of Pretoria, South Africa

Using Artificial Neural Networks to Predict Winners in Horseraces: A Case Study at the Champs de Mars

Sameerchand Pudaruth, University of Mauritius, Mauritius

Interdependent Enterprise Resource Planning risks in Small and Medium-Sized Enterprises in developing countries

Carrington Mugove Mukwasi, University of Cape Town, South Africa

12:30

Lunch

13:30 Closing Plenary 11: Innovation and Research Capacity Building in Malawi

Moderator: **Paul Cunningham, IIMC, Ireland**

Panelists include:

Prof. John D. Kalenga Saka, Vice Chancellor, University of Malawi

Dr. Robert Ridley, Vice Chancellor, Mzuzu University

Prof. George Kanyama Phiri, Vice Chancellor, LUANAR

Martin B. Thawani, Malawi University of Science and Technology

Dr Charles Mwansambo, Principal Secretary, Ministry of Health

Stella Kamkwamba, Director of Agriculture Extension Services, Ministry of Agriculture and Food Security

Best Paper Award

Closing Remarks

Lonely Magreta, Permanent Secretary for Education, Science and Technology, Malawi

Opening Plenary



The Opening Plenary Session was in two parts, starting with a number of high-level presentations from the Host Government, European Commission and African Union Commission to provide an overall political context for the **IST-Africa 2015** Conference.

Mr Mike Kachedwa, National Commission for Science and Technology as the Master of Ceremonies for the formal Opening Plenary welcomed the plenary speakers (Hon. Emmanuel Fabiano, M.P., Minister of Education, Science and Technology; Mrs Lonely Magreta, Secretary for Education, Science and Technology; Anthony Muyepa-Phiri, Director General, National Commission for Science and Technology; Mr

Morten Møller, Programme Coordination, DG CONNECT, European Commission and Mrs Souhila Amazouz, African Union Commission), participants and dignitaries to **IST-Africa 2015** Conference. He highlighted the relevance and timeliness of hosting **IST-Africa 2015** Conference in Malawi and invited Mr Anthony Muyepa-Phiri, Director General, National Commission for Science and Technology to make the opening remarks.

Opening Remarks, Anthony Muyepa-Phiri, Director General, National Commission for Science and Technology, Malawi

Mr Anthony Muyepa-Phiri acknowledged Hon. Emmanuel Fabiano, M.P., Minister of Education, Science and Technology, Mrs Lonely Magreta, Secretary for Education, Science and Technology, Anthony Muyepa-Phiri, Director General, National Commission for Science and Technology, Mr Morten Møller, Programme Coordination, DG CONNECT, European Commission, Mrs Souhila Amazouz, African Union Commission, Dr Harry Gombachika, Chief Executive Officer, Malawi Telecommunications Limited, Dr Pascal Hoba, CEO, UbuntuNet Alliance, Mr Andrew Kumbatira, Director General, Malawi Communications Regulatory Authority (MACRA), Mr. Paul Cunningham, IST-Africa Founder and Coordinator, Representatives from the public, private and research and education sectors, distinguished participants, and press. Anthony extended all conference participants and invited guests a very warm welcome to this historical event and hoped that international delegates in particular enjoy the warmth and hospitality of Malawi people. He outlined that the National Commission for Science and Technology is honoured to be the national IST-Africa partners for Malawi. NCST's experience of participation at previous IST-Africa Conferences hosted by other African Governments was a key reason why they were enthusiastic about the opportunity for the Government of Malawi to host IST-Africa Week 2015.



IST-Africa 2015 is the tenth anniversary of this prestigious Annual Conference Series that rotates around IST-Africa Partner Countries. Each year, it brings together senior representatives from leading public, private, education & research and societal organisations from across Africa and the rest of the world, to discuss ICT policy as it relates to Innovation, Science and Technology (including ICT), showcase research results and share knowledge and good practices. The Commission is grateful to IST-Africa for recognising and selecting the Government of Malawi through the Ministry of Education, Science and Technology and the National Commission for Science and Technology to host this 10th Anniversary event, providing an opportunity to showcase the progress that Africa and Malawi has made to date and the challenges that remain in achieving the Knowledge Society. It also offers Malawi the opportunity to take stock of various national, regional and international applied ICT Research and Innovation Programmes.

IST-Africa 2015 focuses on the Role of Applied ICT for Africa's Development (including eHealth, Technology Enhanced Learning and ICT Skills, Digital Libraries, eInfrastructures, eAgriculture, Societal Implications of Technology, International Cooperation, ICT4D and eGovernment). It provides a collegiate setting for presentations and discussions of national & regional developments, issues of concern, good practice models, and facilitates networking with peer organisations from around the world. IST-Africa 2015 also provides an invaluable opportunity to identify potential partners for future proposals under the 2016 – 2017 Work Programmes of Horizon 2020.

The Science and Technology sector in Malawi is governed by the National Science and Technology Policy of 2002 and the Science and Technology Act 2003, under which the mandate of the NCST is enshrined. While NCST advises all Government stakeholders on all matters related to science and technology research and innovation in order to achieve science and technology led development, the Commission's specific mission is to promote, support, co-ordinate and regulate the development and application of science and technology Research and Innovation in Malawi to create wealth and improve quality of life of all our citizens.

Anthony outlined that the Mission of the National Commission for Science and Technology is very well aligned with the aims and objectives of IST-Africa initiative, which the Guest of Honour will describe later in his speech. Promoting and coordinating Innovation, Science and Technology matters of adoption, implementation, policy and research to accelerate socio-economic development is at the Commission's responsibilities. Among others, the national Science and Technology Policy calls for the adoption of the following key strategies: Integration of ICTs into general research and training through the establishment of a forum where researchers and the public and private sector can exchange information; Development of a national database on ICT research that should include insight on available services and programmes; Promotion of studies and application of ICTs that develop, evaluate and adapt technologies that aim at increasing competitiveness; and Facilitation of better co-ordination and regulation of research, science and technology pertaining to IST.

Implementing these strategies requires on-going collective and coordinated effort at national level by all relevant innovation stakeholders to ensure that all citizens of Malawi benefit equally, irrespective of geographic location, and that scarce national resources are invested to maximum impact. Anthony outlined that NCST also calls on the international donor community and societal sector stakeholders to maximize the potential multiplier effect of their support for the Malawi people by leveraging ICT, greater coordination of interventions and addressing sustainability issues.

Anthony highlighted the need to work closely together to achieve:

- Enhanced skills capacity (including lifelong learning and literacy opportunities) aligned with national requirements
- A sophisticated education and research sector that provides graduates with skills required by employers in the public, private, education and research and societal as well as skills required by those wishing to become entrepreneurs
- Enhanced public service delivery that enhances quality of life for all citizens and makes it easy for local and international investors to establish businesses
- Alignment of research and innovation activities with national policy objectives
- Greater coordination of interventions irrespective of funding source
- Greater cooperation between public sector actors to co-design and implement sustainable ICT-enabled interventions in the areas of mAgriculture and Food security, mHealthcare and mEducation, to improve the lives of citizens

Anthony outlined that all IST-Africa Partner Countries (including Malawi) will continue to benefit from the sound foundation provided for IST-Africa, through its annual reviews of ICT Initiative s and Research Capacity, Bi-lateral and Multi-lateral Cooperation Agreements supporting ICT/STI Related Activities and Innovation Spaces and Living Labs. He called on all Innovation Stakeholders active in Malawi to actively engage with the National Commission for Science and Technology and IST-Africa to maximize the societal benefits of Innovation, Science and Technology (including ICT). He highlighted that the Commission looks forward to its continued active engagement and collaboration with IST-Africa and the other IST-Africa Partner Countries as we work together towards creating a truly African Information Society and Knowledge Economy for everyone on this Continent.

On behalf of the NCST, Anthony thanked all stakeholders who contributed resources, ideas and their time in the preparation of this international conference. He acknowledged the support of the IST-Africa Consortium, the European Commission, the African Union Commission, the national regulator - MACRA, Skyband, MTL whose invaluable inputs helped make IST-Africa Week 2015 possible. He outlined that he particularly wishes to thank the Coordinators of IST-Africa, Paul Cunningham and Miriam Cunningham of IIMC (International Information Management Corporation) Ireland for their long standing commitment and vision, and Gift Kadzamira, Ebony Msikawanthu and the rest of the NCST team who collaborated closely with Paul and Miriam to ensure that the 10th IST-Africa Week builds momentum for the decade ahead. He wishes the participants fruitful knowledge sharing and collaborations during **IST-Africa 2015** Week.

European Commission Address, Mr Morten Møller, Programme Coordination, DG CONNECT, European Commission

Mr Morten Møller acknowledged the Honourable Minister, Secretary for Education, Science and Technology, distinguished panellists and delegates. On behalf of the European Commission Morten welcomed all the participants to the **IST-Africa 2015 Conference** in Lilongwe, Malawi and outlined his pleasure to speak before such a distinguished audience of policy makers, government representatives, company managers and researchers from Africa and other continents. He expressed his gratitude to the organisers of this event and thanked the Government of Malawi for hosting it.



Morten commenced by providing a brief insight into the European Union single market is a cornerstone of an open, global economy. A completed Digital Single Market will support Europe's position in information and communication technology; the completion of the single market will offer opportunities to European companies and non-European companies on an equal footing. The Digital Single Market is intricately and intrinsically related to the good functioning of an open and free Internet; hence the importance of a solid multi-stakeholder governance model for the Internet. Europe needs the support of its partners if the global digital economy is to remain open. The Digital Single Market is an ambitious endeavour, addressing uncertainties in jurisdictional systems, discrimination against consumers when accessing content (such as geo-blocking) and regulatory obstacles.

Morten highlighted that he represents the Directorate General for Communication Networks, Content and Technologies - DG CONNECT – and their vision for Africa is centred on the guiding principle that broadband connectivity has become a basic infrastructure in a modern society, just like roads, electricity or water, affecting directly the daily social and economic activities; this principle has to be closely interrelated with the enabling policy and regulatory environment of broadband connectivity. This vision stems directly from DG CONNECT's ICT for Development policy centred around three key priorities, which are e-infrastructures, regulatory approximation, and ICT capacity building. 'Connectivity' therefore is the main thrust of DG CONNECT's strategy for Africa's entry into the global digital economy and networked society. In this regard, AfricaConnect is a catalyst project that can provide the necessary high-bandwidth connectivity for a large number of activities.

Another important priority is the harmonisation and alignment of the e-communications policies and regulatory frameworks in the developing countries with the relevant EU framework so as to promote a fair and transparent enabling environment, which will improve ICT access for citizens, businesses and organisations in these countries – a common set of rules will facilitate market access for players from both sides to a larger market.

And last but not least, it is important to also focus on ICT capacity building for reducing the digital divide, including gender divide, through the uptake and better understanding of the new emerging technologies, applications and services, the roll-out of broadband, and the promotion of free and open access to the Internet.

Activities in these three main areas are closely interrelated. For example, the on-going feasibility study for the AfricaConnect extension outlines that high prices of broadband connectivity in most African countries and the problems for cross-border connectivity are partly a result of regulatory failure. Also, regional interconnectivity for Research and Education Networks (such as AfricaConnect) produces a lowering effect in telecommunication prices and improvements in the offer of broadband services for all.

It is obvious that the role of research and innovation is crucial for developing further the cooperation between the EU and the African countries and for tackling global and common societal challenges. We all know how much Information and Communication Technologies have changed our daily lives in the past two decades. ICT also play a key role in creating sustainable jobs and fostering economic growth. Moreover, ICTs contribute significantly to economic recovery and long-term prosperity all over the world. This is particularly important during the current economic and fiscal instability in Europe and elsewhere where a strong ICT component will be indispensable for boosting growth.

The European Commission is fully aware of the fact that in a changing world the EU needs to have a smart, sustainable and inclusive economy. These three mutually reinforcing priorities should help the EU and the Member States deliver high levels of employment, productivity and social cohesion. In 2014 the European Commission launched Horizon 2020, Europe's ambitious Framework Programme for Research and Innovation. The ultimate goal of Horizon 2020 is to maximise the contribution of EU funded research and innovation to sustainable growth and jobs and to tackling the grand challenges facing Europe today, such as climate change, energy and food security, health and our ageing population.

Horizon 2020 is structured around three major priorities:

- Industrial leadership;
- Societal challenges; and
- Excellent science

The industrial leadership priority aims at supporting strategic investments in key technologies. ICT is one of these areas but it also includes other domains such as advanced manufacturing, nanotechnologies, or biotechnology. By "societal challenges" we understand multidisciplinary applied research aiming at tackling major societal problems that are particularly acute in today's world and that reflect EU 2020 objectives of a sustainable development. World leading innovation cannot be achieved in the long run without a sustained investment in world class science. This is a matter

of supporting human capital development by attracting and retaining the most talented people and providing them the needed research infrastructures. This constitutes precisely the focus of the “excellent science” priority.

Morten emphasised that International cooperation remains an important cross-cutting priority of Horizon 2020. In addition to Horizon 2020 being fully open to international participation, targeted actions with key partner countries and regions, including Africa, will focus on the EU's strategic priorities. The goal is to ensure a strategic and coherent approach to international cooperation across Horizon 2020.

Overall, in 2015 calls for proposals, almost 150M€ are at stake for innovative SMEs, close to 600M€ are available for the core ICT technologies, services and applications, and 125M€ will support the challenging next generation of communication networks (5G). In total around € 1 billion is there to support ICT ideas. It is expected that it will activate a similar scale of investment from the beneficiaries.

There were 105 participations from African organisations under the ICT and Research Infrastructure themes in the previous 7th Framework Programme for Research and Development. Morten expressed confidence that this target can certainly be repeated and even surpassed under H2020. The aim is to increase participation from third countries by fifty percent in Horizon 2020.

The European Commission has just closed the proposal submission for the second ICT Call in Horizon 2020. It included Objective ICT-39 aimed at reinforcing cooperation and strategic partnership with low and middle income countries in sub-Saharan Africa. It is expected that the collaborative research and innovation projects emerging from this Call will address the requirements of end-user communities in a number of African countries. It was a prerequisite to submit a proposal to that call that there is a clear demand driven approach - users in Africa should choose what technologies are most relevant to roll out. The technological targets could include co-design, adaptation, demonstration and validation of ICT related research and innovation in relevant themes addressed by Horizon 2020, including Content Technologies and Societal Challenges. The overall budget for this topic was €11 million, and the European Commission expects to be able to fund 4 - 5 projects. The response to this topic was quite enthusiastic with forty five proposals submitted. They cover quite a wide variety of themes. Independent experts will evaluate the proposals. The most successful ones will receive the EU funding and should kick off towards the end of this year. All these projects will have African partners. Building on the enthusiastic response to this call, DG CONNECT plans to include a call focused on cooperation with Africa in the ICT 2017 Work Programme with a budget of € 13 million.

Participation of organisations from Africa in the Horizon 2020 calls for proposals, including those focussing on ICT research and innovation, is an important element of the European Commission's international Research and Innovation strategy emphasizing the general openness of the EU's framework programme. It is important to keep in mind that all Horizon 2020 Calls are open for participation by African research organisations - their participation is not restricted to specific African-centric calls. The European Commission expects that the 2016 - 2017 Work Programme will be approved in September 2015 and presented during ICT 2015 in October 2015.

In conclusion Morten highlighted that there are numerous opportunities for collaboration between Europe and Africa. He encouraged participants to leverage this conference to identify concrete proposals and projects for collaboration. He wished the participants a successful and productive conference.

African Union Commission Address by Mrs Souhila Amazouz

Mrs Souhila Amazouz acknowledged the Honourable Minister, Secretary for Education, Science and Technology, the DG of NCST, the representative of the European Commission and delegates.

Souhila highlighted that the advent of digital Information and Communication Technologies (ICTs) has changed the lives of all people around the globe. The acceleration and reliability of networks have changed the way we communicate study, the way to inform, to entertain to organize, to develop and to work. It is now certain that beyond 2020, lives and business will be driven by the revolution of the Internet of things and Things of the Internet era. And Africa must be ready and should not miss the turn of this digital era as it did in the industrialization era.

The overall vision of the ICT sector in Africa is therefore to build the soft and hard infrastructures that will enable the continent to participate in the Information Society and lead the fundamental changes of the 21st century in the digital economy. The short-term vision is to quadruple the access to broadband services by 2030 allowing a major transformation of the continent. Internet openness and accessibility have become preconditions for the



enjoyment of fundamental rights. The potential for us all to develop and improve the quality of our lives will be limited unless we make the Internet sustainable, robust, secure and stable. Broadband access is an important element in avoiding “info-exclusion” and ensuring our citizens’ participation in the information society.

Broadband also has the power to revolutionize the education and bring it into the lives of everyone no matter where they live. Distance learning could never have happened without ICTs and Broadband which have also brought the democratization of information and knowledge. The Communications and Information technologies landscape is changing rapidly and its environment is shifting dramatically.

Souhila outlined that there is no doubt that the ICTs have changed Africa fundamentally in the past decade, The effect of ICTs on the African economy is impressive. They have empowered the lives of people and highly contributed in driving entrepreneurship, innovation and income growth. Due to the development of broadband, Internet will become even faster, available anytime and anywhere. The “Internet of Things” will emerge, connecting objects, rooms and machines. Consequently, we, the policy makers need to review our approaches and adapt ourselves to the new world of ICT. This is our challenge: Building an African information society for future generations. The future is today

Souhila highlighted that the African Union Commission has taken steps to improve access, promote electronic transaction, combating cyber-crime and launching the .Africa TLD. More specifically the following milestones have been accomplished:

Firstly, out of 30 Member States that had no Internet Exchange Points, Best Practice and Internet community mobilization workshops have successfully been conducted in 28 Member States, leading to agreement to establish an Internet Exchange Point in the respective Member States. Capacity building on Technical Aspects of Setting up, Operating and Administering Internet Exchange Points was conducted in 28 AU Member States in the context of the African Internet Exchange System (AXIS) project. A total of 500 participants have been awarded certificates for this training to enable them to prepare their respective networks to interconnect to the envisaged National Internet Exchange Points. National Internet Exchange Point has been launched in 6 Member States (Namibia, Burundi, Gambia, Seychelles, Gabon and Swaziland) following equipment support and technical assistance. Best Practice and Benefits of establishing Regional Internet Exchange Point and Regional Internet Carrier workshops have been organized in 5 regions (Southern, Eastern, West, centre and Northern Regions). Workshops on the formulation of template and roadmap for the development of Regional Interconnection policy and regulatory framework were held in 3 regions (South, East and West).

Secondly, in response to a call by the African Union Ministers in charge of Communication and Information Technologies meeting in Johannesburg, South Africa in 2009, to the African Union Commission to jointly develop with the United Nations Economic Commission for Africa, a convention on cyber legislation for the Continent that adheres to the legal and regulatory requirements on electronic transactions, cyber security, and personal data protection. Souhila announced that the Convention has been adopted by AU Organs and it is now ready for ratification by Member States.

Thirdly, on 26 March 2014, at ICANN-49 meeting, the Registry Agreement for dotAfrica domain name was signed in Singapore by Internet Corporation for Assigned Names and Numbers (ICANN) and ZA Central Registry (ZACR) the technical operator appointed by AUC, in the presence of the African Union Commission (AUC). Despite delays on the launching because of ICANN Independent Review Panel (IRP), it is anticipated that the first domain names on DotAfrica will be delegated as soon as November 2014.

In a move towards a more genuine multi-stakeholder model of governance, the IANA coordination and ICANN accountability committees have been established during the ICANN50 meeting that took place in London during April 2016. Souhila highlighted that Africa must have a voice in the IANA transition.

The African Union Commission strongly believes that the building of an Africa’s information society requires a secure cyber space, an appropriate infrastructure and efficient coordination. Multilingualism in cyberspace is a key concept to ensure cultural diversity and participation of all linguistic groups in the information society. Ensuring global access on Internet exchange points is also an important essential component in making the Internet affordable and on-going.

The 4th ordinary session of the African Union Conference of Ministers in charge of Communication and Information Technologies (CITMC-4) held in Sudan in September 2012 requested Member States “to support the establishment of national IGF to create dialogue between all stakeholders on ICT for development issues and facilitate the countries’ participation in the regional and African IGF processes as well as in the global IGF”. Furthermore, the Regional Economic Communities (RECs) have recommended in their last coordination meeting held in Mauritius in May 2014 that since Internet Governance (IG) is becoming more and more of a political nature and a geopolitical strategy, the IGF matter would be better coordinated by the organizations in charge of harmonization of policies and regulations and preparation of African position in the international forums. The AUC is inviting all stakeholders to join us and together develop ICTs for the benefit of our economies, for the benefit of our people. This is what drives our action. This is what will achieve the integration of Africa.

In conclusion Souhila outlined that the African Union Commission reiterates its continued support to harness the

potential of technology and knowledge, and to find effective and innovative ways to put this potential at the service of African citizens. She thanked the IST-Africa organisers and wishes the delegates fruitful deliberations.

Welcome Address, Lonely Magreta, Secretary for Education, Science and Technology, Malawi



Mrs Lonely Magreta acknowledged the presence of the Hon. Emmanuel Fabiano, M.P., Minister of Education, Science and Technology, Anthony Muyepa-Phiri, Director General, NCST; Mr Morten Møller, Programme Coordination, DG CONNECT, European Commission and Mrs Souhila Amazouz, African Union Commission and delegates.

Lonely extended a warm welcome to all IST-Africa 2015 delegates to Malawi, the Warm Heart of Africa. She expressed her gratitude to IST-Africa for organising this strategic conference in Malawi. The Government of Malawi is honoured to host the tenth anniversary of IST-Africa Conference Series. Lonely highlighted that the objectives of IST-Africa Week are very relevant and timely for Malawi innovators, practitioners and researchers from the public, private, education, research

and other sectors. The rich agenda and the knowledge and expertise of the conference delegates provide an invaluable opportunity for those responsible for policy formulation and execution in Malawi, especially the Ministry of Education to benchmark existing policies to ensure that they are fit for purpose and inform future policy developments, based on appropriate adaptation of African and international good practices.

Furthermore since ICTs are essential enablers to achieve the goal of education for all and support lifelong learning. The Malawi Government has adopted plans and strategies to harness the power and potential of new technologies to provide wider access to higher quality learning opportunities that are designed around employment opportunities, particularly in the private and public sectors. With the youngest and fastest growing population on the planet, Africa is experiencing an unprecedented demand for secondary and tertiary education opportunities. Lonely highlighted that the simple reality is that the use of ICTs is essential to meet the expected demand and to help strengthen community empowerment by reducing the Digital Divide between rural and urban areas and addressing issues such as adult illiteracy, youth development and empowerment of women.

Lonely outlined that she has the honour to invite Hon. Emmanuel Fabiano, M.P., Minister of Education, Science and Technology to open the conference.

Official Opening Speech, Hon. Emmanuel Fabiano, M.P., Minister of Education, Science and Technology

Hon. Emmanuel Fabiano, M.P. acknowledged the presence of Mrs Lonely Magreta, Secretary for Education, Science and Technology, Anthony Muyepa-Phiri, Director General, NCST, Mr Morten Møller, Programme Coordination, DG CONNECT, European Commission, Mrs Souhila Amazouz, African Union Commission, Mr Andrew Kumbatira, DG, MACRA, Dr Harry Gombachika, Chief Executive Officer, Malawi Telecommunications Limited, Dr Pascal Hoba, CEO, UbuntuNet Alliance, Mr. Paul Cunningham, IST-Africa Coordinator, Honourable Ambassadors, Representatives from the public, private and research and education sectors, distinguished participants, and press.

Hon. Emmanuel Fabiano, M.P. outlined that he was greatly honoured and privileged to preside over the official opening of the 10th Anniversary of the IST-Africa Conference Series. On behalf of the Malawi Government, he thanked IST-Africa and the Conference Organisers for choosing to hold this important international meeting in Malawi. He particularly welcome distinguished delegates from outside Malawi, inviting them to take the time to enjoy what the Warm Heart of Africa has to offer including Lake Malawi.

Founded in 2002, supported by the European Commission and African Union Commission and has been co-funded under European Framework Programme since 2005, IST-Africa is a strategic partnership with Ministries



and National Councils responsible for Innovation, Science and Technology adoption, implementation, policy and research in 18 African Countries. IST-Africa facilities and supports: International Innovation, Research and Policy Cooperation; Knowledge Sharing and Skills transfer between IST-Africa partners; Collaborative Innovation, ICT Entrepreneurship, Innovation Spaces and Living Labs and Africa-EU Strategic Partnership (with a particular focus on Information Society, ICT, Innovation and Entrepreneurship)

The IST-Africa conferences take place annually and rotate around IST-Africa Partner Countries. The first IST-Africa Conference was held in South Africa in 2006, with subsequent conferences taking place in Mozambique, Namibia, Uganda, South Africa, Botswana, Tanzania, Kenya and Mauritius.

The IST-Africa Conference Series provides an African platform to strengthen Innovation, Science and Technology related policy dialogues within Africa and between Africa and Europe through Plenary Sessions, the rich thematic knowledge exchange achieved through the Scientific Programme over the next three days as well as co-located multi-lateral and bi-lateral meetings that have been taken place since Monday. Each IST-Africa Conference places a special emphasis on showcasing success stories and challenges from the Host Country in achieving the Information Society and Knowledge Economy, as well as Entrepreneurship and ICT related Adoption, Innovation and Research Capacity. To this end, Hon. Emmanuel Fabiano, M.P. outlined that he was delighted that the scientific programme included many presentations from Malawi, and the Closing Plenary focused on Innovation, Science and Technology success stories and challenges in Malawi.

Hon. Emmanuel Fabiano, M.P. highlighted that IST-Africa 2015 has brought together over 400 senior representatives from leading government, industry and research organisations in 26 African Member States and 13 European Member States to share knowledge, experience, lessons learnt and good practices in critical areas including Mobile Health, Technology Enhanced Learning & ICT Skills, Digital Libraries, eInfrastructures, eAgriculture, Societal Implications of Technology, International Cooperation, ICT4D and eGovernment. IST-Africa 2015 provides an opportunity for members of the IST-Africa Community to come together in Malawi to

- Support the goals of Africa-EU Strategic Partnership by sharing ICT related research results and innovations for wider adaptation and exploitation
- Identify and discuss potential opportunities for ICT related research and innovation collaboration both between African and between African and European innovation stakeholders from the public, private, education and research and societal sectors
- Strengthen relationships with existing and new collaborators and
- Learn more about the current level of research and innovation capacity in Malawi and opportunities to support achieving the Knowledge Society in Malawi by actively engaging with the significant number of local stakeholders who are participating at this year's conference

Hon. Emmanuel Fabiano, M.P. outlined that he found the aims of this international conference to be critical and very pertinent for both national development in Malawi and regional African development. He urged all conference participants to seize this opportunity, introduce yourself to potential future collaborators, take the discussions that result seriously and develop activities that will provide a tangible legacy of IST-Africa Week being hosted in Malawi for the first time.

ICT related technology, research and innovation has reduced geographical barriers and provided opportunities for Generational Leapfrogging which is essential for Malawi and Africa in general to accelerate sustainable socio-economic development, attract Foreign Direct Investment and strengthen capacity to provide high quality educational, healthcare and employment opportunities to all its citizens - as well as sustainable food security and access to energy.

Building an entrepreneurial culture is a key responsibility of the public, private, education and research and societal sectors, to provide opportunities for and leverage the enormous potential offered by its young population. In many areas of mobile technologies (particularly mobile payments), Africa is leading the way internationally. We all need to take ownership and responsibility for leveraging the potential of collaborative open innovation to build the society we aspire to for our children and our children's children. While still a significant importer of ICT goods and services, with the proper investment in infrastructure and education, and the continued support of the European Commission and other Development Partners, Malawi and Africa is on the move.

According to the UN Economic Commission for Africa (2013), "ICT service exports have become an important source of foreign exchange, employment, technological learning and diversification of economies in Africa. As a proportion of total exports, ICT service exports from the continent increased from less than 0.1 per cent in 1990 to about 1.5 per cent of total exports in 2009. ICT goods grew from 0 per cent in 1990 to about 0.4 per cent in 2009 of total merchandise exports. As such, the ICT sector is also a major employer in Africa. A greater percentage is employed in the mobile sector which accounted for approximately 1.4 per cent of the total African workforce, suggesting a total workforce of 5.8 million people."

On behalf of the Malawi Government, Hon. Emmanuel Fabiano, M.P. proudly said that Malawi is making a significant

commitment to leveraging ICT to achieve the Knowledge Society.

Firstly, the e-government programme which has the objective of modernising and improving efficiency of public services, is a critical component of the Malawi Information and Communications Technology (ICT) policy, whose overall aim is to promote national socio-economic development to achieve the aspirations of Vision 2020, with a particular focus on the contribution of ICT to poverty reduction. .

Secondly, the eLegislation initiative which aims to establish a responsive ICT Legal framework to facilitate competition, development and participation of Malawi in the Information Society and more particularly the legislation

Thirdly the adoption of the Malawi ICT policy which provides a framework responsible for the promotion of ICTs in education systems at all levels in order to improve both the access and the quality of education, improve management of education systems and improve ICT literacy.

Fourthly the World Bank funded Regional Communication Integration Project (RCIP) which facilitates the provision of a wet portion (submarine cable) solution to dry portion (overland) connectivity to eligible countries. It is managed by the Privatisation Commission in partnership with MACRA and the eGovernment Department. Under the Enabling environment activity, the project intends to review the Communication Act of 1998; build capacity amongst its agencies especially those involved in the policy and regulatory supervision of the ICT sector. In addition, by September 2013, the Last Mile Connectivity Initiative, which is the third phase of the Project, was implemented.

Fifthly, the Malawi Library and Information Consortium (MALICO) has been working with organisations such as INASP (International Network for the Availability of Scientific Publications) and EIFL (Electronic Information for Libraries) to improve access to, and production and use of, research information and knowledge for sustainable development.

Sixthly, Chancellor College and MACRA are cooperating to undertake TV White Spaces trials in Malawi to use this spectrum to provide cost-effective connectivity in rural areas that have limited infrastructure.

Last but not least the establishment of the National Internet Exchange Point which has assisted in keeping traffic, at a national level, local. It is also assisting in improving connectivity, efficiency as well as conserving upstream bandwidth and improving on security for national data and national transactions.

Finally the Malawi Research and Education Network (MAREN) is responsible for connecting the education and research community in Malawi to the UbuntuNet Alliance and GEANT research and education networks. This will enable Malawian researchers to:

- collaborate and share data and remote instruments over the high speed network;
- Participate in cutting edge research in fields such as Agriculture and Natural Resources Management, Bio-medical Sciences, Health, Climate Change, High Energy Physics, Radio Astronomy, Earth Observation and Early Warning, Arts and Culture, and many other of interest to Malawi. Malawi researchers will be equal partners with their colleagues in the region and further afield, participating in research teams conducting research across the network tackling common research challenges.

Hon. Emmanuel Fabiano, M.P. outlined that much as ICT is changing people's lives for the better, there are some challenges that have to be addressed if we are to achieve the potential benefits of the Knowledge Society in Malawi and Africa as a whole. These include increasing the currently low supply of students and graduates with ICT skills and adopting and implementing relevant and sufficient regulatory frameworks including policies and legislations that can curb issues such as cyber crime, intrusion and loss of privacy.

The national infrastructure and communication platform which is integral in transforming Malawi is also still inadequate. It is high time that we develop an ICT research roadmap to facilitate the adaptation and creation of technologies co-designed around African needs.

Hon. Emmanuel Fabiano, M.P. indicated that he was confident that many of these issues will be addressed and discussed over the next three days. These challenges must be simultaneously addressed from the Research, Innovation and Policy fronts. He appealed to all participants to intensify research, innovation and implementation projects aimed at extending current ICT knowledge and fighting the types of ICT challenges mentioned above. It is important for all research and Innovation actors in Malawi and across Africa to take full advantage of funding opportunities given by the European Commission under Horizon 2020 which is a new Framework Programme to implement Research and Innovation around three main pillars i.e. Excellent Science; Industrial Leadership and Societal Challenges with funds amounting to €80 billion from 2014 – 2020.

Hon. Emmanuel Fabiano, M.P. highlighted that he knew that IST-Africa has been extremely successful in

collaborating closely with Research and Innovation stakeholders from IST-Africa Partner Countries to build the partnerships with European organisations required to secure funding under FP7, the last phase of the European Framework Programme. What is less well understood from the outside, are the additional benefits experienced by the partners through the strong personal relationships established between peer organisations across the 18 Partner Countries. This facilitates exchange of knowledge and experience that informs policy development and implementation by taking account of unintended consequences experienced in other African Member States.

Hon. Emmanuel Fabiano, M.P. strongly encouraged the European Commission and African Union Commission to commit the necessary resources required by the IST-Africa team to continue its excellent work, in strengthening the research and innovation capacity of African universities, informing policy, supporting wider adoption of Open Innovation and ICT entrepreneurship and helping African research and innovation stakeholders attract funding under Horizon 2020.

Building a network of 18 Partner Countries and a community of over 9,000 individuals in 13 years is a phenomenal achievement. What is more impressive is the number of other African Member States who would like to join the network. This requires the commitment of significant financial resources to sustain the growth of IST-Africa into a truly pan-African Network.

Regarding Policy, Hon. Emmanuel Fabiano, M.P. outlined that his expectation is that the conference will help stimulate the necessary discussion, analysis and exchange of good practices to inform policy recommendations addressing these serious issues.

In conclusion, Hon. Emmanuel Fabiano, M.P. thanked the IST-Africa Consortium, the European Commission, the African Union Commission, the national regulator - MACRA, Skyband, MTL, and other international and local partners for supporting the conference. On behalf of the delegates he particularly thanked IIMC, Ireland – the IST-Africa Coordinator and the National Commission for Science and Technology, which is in his Ministry and the National IST-Africa Partner for Malawi, for their close collaboration in ensuring IST-Africa Week 2015 in Lilongwe is a great success. With these remarks, Hon. Emmanuel Fabiano, M.P. had the honour and duty to declare the IST-Africa 2015 Conference officially open.

High Level Roundtable on the Implementation of the Information Society in Africa

Paul Cunningham, IST-Africa Coordinator welcomed the panelists and participants to the High Level Roundtable on the Implementation of the Information Society in Africa.

Paul introduced the panelists including Lonely Magreta, Secretary for Education, Science and Technology; Anthony Muyepa-Phiri, Director General, NCST / CTO MAREN; Andrew Kumbatira, Director General, Malawi Communications Regulatory Authority (MACRA); Dr Harry Gombachika, Chief Executive Officer, Malawi Telecommunications Limited; Victor Malewa, Deputy Director, Department of e-Government, Ministry of Information; Souhila Amazouz, Infrastructure and Energy Department, African Union Commission; Dr Pascal Hoba, CEO, UbuntuNet Alliance; Dr Paulos Nyirenda, CEO, SDNP and Bessie Nyirenda, Management Consultant, Malawi Institute of Management and invited the audience to give them a warm welcome of applause.

Paul outlined that the Roundtable will take the format of short interventions around a number of agreed talking points aligned with the Research and Innovation, STI and ICT aspects of the Joint Africa – EU Strategy (JAES) Roadmap 2014 – 2017. This Roadmap recognises the importance of taking “an integrated approach recognising the important cross-cutting nature of innovation/entrepreneurship, research infrastructures and technical skills development in Africa and Europe” [Section 31] and as well as “implementation of a three-pronged ICT for Development Strategy “Connecting Africa” [Section 50].

Progress in implementing the Information Society and Knowledge Economy in Africa and the role of Research and Innovation leveraging ICT

The Roundtable commenced by discussing Progress in implementing the Information Society and Knowledge Economy in Africa and the role of Research and Innovation leveraging ICT.

Paul invited **Souhila Amazouz, Infrastructure and Energy Department, African Union Commission** to provide the first intervention.

Souhila commenced by outlining that it is recognised that broadband is an essential element for the Digital Economy and broadband infrastructure can make a major contribution to achieving sustainable development and strengthening access to the infrastructure and services. It is therefore necessary for it to be one of the major priorities of African countries. Government should develop legal and regulatory environments conducive for improved broadcast access. The government should also ensure allocation of the required resources for implementation and encourage

private sector participation. They need to review and develop comprehensive policy frameworks for enhancing broadband access in collaboration with all the relevant stakeholders including civil society and private sector, in order to support accelerated growth and technological transformation. Despite a lot of work that has been done in relation to harmonisation of broadband policies and frameworks by the Regional Economy Communities and other regional organisations to increase connectivity of the networks in particular the cross border, the transposition at sub-regional and national level is still low. Member States should take measures to transpose the regional agreed laws into national legislation. A number of projects have been undertaken focused on harmonisation of regional policies with different Regional Economic Communities and within the NEPAD High level infrastructure community network. At this stage special attention should be paid to the development of national broadband infrastructure to achieve interconnectivity. Given the changing ICT sector modern regulatory approaches should be adopted at national level. While it is positive that a number of countries has already established national strategy for broadband and the development of information society, some countries still need to develop a national strategy.

Paul thanked Souhila for this insight and invited **Andrew Kumbatira, Director General, Malawi Communications Regulatory Authority (MACRA)** to provide a regulatory perspective.

Andrew commenced by recognising the presence of Hon. Emmanuel Fabiano, M.P., Minister of Education, Science and Technology, Mr Morten Moller, European Commission and other panelists. In relation to progress in implementing the Information Society and Knowledge Economy in Africa. Andrew believed that this expert community participating in IST-Africa are already aware that the Internet has change the way of life and it is going to continue to change and affect the way we live. People who cannot interact freely with ICTs will very soon be people like who cannot read and write now. Andrew highlighted that it is important that we do everything possible to accommodate the citizens of Africa, and Malawi in this case, to help them connect with ICTs, as it is now the way of life. It is a crosscutting tool and it is the catalyst for growth and development. As a regulator, the Malawi Communications Regulatory Authority MACRA has a duty to balance and achieve the delicate equilibrium in this process. For example if we take mobile operators and invest their considerable money in our economies, they should be allowed to recoup their investment but at the same time, the Government has a duty to ensure that citizens access these services. The services must be affordable, efficient and available. So the challenge in a country like Malawi is how to get a balance that facilities operators to recoup their benefits while at the same time allow access to citizens in the most rural remote areas. Andrew indicated that the Malawi delegates will know that recently there have been serious complaints that tariffs are too high and citizens feel that telecom operators are making too much money. As a regulator the tool that we use to support balance is the regulation. It is necessary to have a legal framework in place, which is consistent with the current environment. The sector is moving extremely fast - things change rapidly. Within eighteen months, technology becomes obsolete. As a result the challenge is how to have regulation or a legal framework that can keep at best with such fast changing situations. In the case of Malawi, the regulation was passed in 1998. At that time people did not know you could transfer money on a mobile phone, watch a movie or be on Facebook. As a result legislation is fixed in time, while things change in day to day life. Legislation needs to provide a framework which is technology neutral, and can accommodate the fast pace of changing of things around the ICT.

Paul thanked Andrew for sharing these practical challenges and invited **Dr Pascal Hobba, CEO, UbuntuNet Alliance** to provide the perspective of a Regional Education and Research Network.

Pascal outlined that from UbuntuNet Alliance's perspective it is true that research and innovations are critical for the Knowledge Society and Knowledge Economy in Africa as well as elsewhere. Pascal highlighted that innovations come from research institutions and University academic, who stimulate research that can bring solutions for day-to-day activities such as mobile payment, technologies and so on. But this requires a minimal of infrastructure. From Ubuntunet's point of view the infrastructure, the connectivity is essential. Pascal highlighted that if Africa wants to take full advantage of knowledge and impact more on development, it is essential to have affordable connectivity and high quality of bandwidth, high speed of internet for research institutions so that they can collaborate, is from collaboration that innovations are come up. It is also essential that Southern and Eastern Africa National Research and Education Networks (NRENs) can be properly connected, so that we can take full advantage of the Knowledge Society. In Morten Moller's speech this morning, he touched on a critical point - connectivity is a basic need today. We need to understand this and ensure awareness among policy makers. In conclusion Pascal outlined that there is general awareness of the need for roads in country, now there needs to be awareness that connectivity supports knowledge exchange, collaboration and impacts on the day-to-day life of our people.

Paul thanked Pascal for this insight and indicated that this lead every well to the next discussion point focused on supporting eInfrastructure in Africa.

eInfrastructure

Paul then invited the panel to discuss *"How does improved eInfrastructure in Africa (and concrete*

developments such as AfricaConnect, African Internet Exchange System (AXIS), Progress on developing African national and regional research & education networks (NRENs) and their interconnection to European GÉANT2 network) support the transformation of education and research cooperation?"

Souhila Amazouz (AUC) outlined that African countries benefit from improved eInfrastructure, secure use of ICTs and building confidence in the use of the internet applications to support financial, educational, eGovernment and health services. To do all this, we need to put up the relevant strategies, regulations and regional harmonisation in place to reap the benefits of ICTs.

Paul thanked Souhila and invited **Dr Pascal Hoba (UbuntuNet Alliance)** to comment from the perspective of the Regional Education and Research Network.

Pascal outlined that this is an important area for UbuntuNet Alliance and that a lot has been achieved in the past five years. When the UbuntuNet London Routing Hub was commissioned in January 2008 there was a 1Gb connection. The UbuntuNet network has continued to grow in Southern and East Africa with an increased number of NREN becoming connected. From 2013 the Africa Connect co-funded project from the European Commission has supported the procurement of connectivity services in Southern and Eastern Africa. Points of presence have been put in place, a STM-4 link from Amsterdam to Nairobi and links between Nairobi to Kampala, to Kigali, Maputo and Dar es Salaam are now in place. eInfrastructure has dramatically improved and NREN can take full advantage of the connectivity in the region. Pascal concluded that there is still work to be done and he was very pleased to announce that UbuntuNet will benefit again for the second phase of the Africa Connect project. It is important that Governments support the NREN of each country so they can take full advantage of the connectivity in the region.

Paul thanked Pascal and invited **Lonely Magreta (Secretary for Education, Science and Technology)** to comment from the perspective of the Ministry

Lonely outlined that from the Ministry of Education, Science and Technology's point of view there are two main objectives of the National Policy for Education, Science and Technology. Firstly, to increase [equitable] access to education and also to improve the quality and relevance of education. Considering the available infrastructure we cannot afford to increase access to education by depending on physical infrastructure and therefore improved ICT connectivity is very important so that as many candidates as possible could access education at all levels. ICT infrastructure is important at primary school as well as secondary where it is one of the subjects. MAREN is a part of UbuntuNet Alliance. However to benefit more, there is a need for deliberate budgeting for ICT innovations in the national budgets to ensure that there are funds in place to pay for increased connectivity so that the efficiency at all levels. Secondly, the Government has recognised that while there is a need to support ICT by including a policy statement in the national educational sector plan, which indicates that Government should focus on infrastructure developing on science, technology, laboratories, workshops and information and computer technologies. In conclusion Lonely highlighted that with the severe limitations on physical infrastructure, MAREN is very important in order to achieve these goals to improved quality and the relevance of education, as well as increased access to equitable education.

Paul thanked Lonely and invited **Anthony Muyepa-Phiri (NCST/MAREN)** to provide his perspective.

Anthony outlined that the NRENs (National Research and Education Networks) are private networks that interconnect campuses, universities, research institutions in each country. They are represented by an organisation, so in Malawi, the NREN for Malawi is called the Malawi Research and Education Network (MAREN). The move to support the establishment of NRENs was supported by UNDP and ITU in the context of Millennium development initiatives. NRENs support collaborative research to be carried out by researchers that are based in other countries. As a global research and education network, they play a role as a catalyst that facilitates such collaboration by enabling both national as well as global information sharing, and the sharing of resources that are critical for research and education. MAREN has been instrumental in establishing the Internet Exchange Point (IXP) in Malawi, highlighting Cyber Security issues and acting as a certification authority. While it is recognised that MAREN has an important role to play in Malawi to improve connectivity at higher education institutions and support collaborative research with institutions outside the country, there have been challenges in operationalising it and benefiting from participation in AfricaConnect.. MAREN has the potential to support Knowledge exchange amongst scholars, researchers, students and entrepreneurs through the provision of the advanced network services for the faster development of Malawi.

Paul thanked Anthony and invited **Dr Pascal Hoba (UbuntuNet Alliance)** to comment in relation to connectivity pricing improvements.

Pascal highlighted that connectivity has dramatically improved across the region. In 2006 for example NREN members of UbuntuNet Alliance were paying more than \$1.4 million per month for less than 800Mb per second. Now connectivity can be provided for less than \$150 per Mb per month, which is a huge advantage to the region.

How can Innovation be better supported to ensure faster take up of co-created products and services?

Moving to the next topic for discussion Paul outlined that over the last five years, Africa has experienced a dramatic increase in ICT-related Innovation with the emergence of both independent and university based Innovation Spaces (e.g. Pre-Incubators, Incubators, Accelerators, Entrepreneurship Centres) supporting Technology Entrepreneurship. Paul invited the panel to discuss how Innovation can be better supported to ensure faster take up of co-created products and services, in both the public and private sector that meet African needs out of the box, i.e., co-created products and services based on local needs? What are the implications for potential policy changes?

Paul invited **Anthony Muyepa-Phiri (NCST)** to kick start the discussion.

Anthony outlined that this is very pertinent topic. The Government of Malawi realises that the role of Science, Technology and Innovation (STI) in the modern economy in which knowledge plays a central role in boosting the work creation, social welfare as well international competitiveness. In this context NCST was established under the Minsitry of Education, Science and Technology to provide an advisory and coordination framework as well as promote STI. In order for Malawi to realise the maximum benefits from research, it is necessary to look at the whole Innovation ecosystem and determine how to coordinate activities, exploit results and provide necessary support at different levels. Sensitisation activities are also necessary among citizens to raise awareness of how they can leverage eServices across different thematic domains. It is necessary to actively support a culture of creativity, innovativeness and continuous learning as well as to take up and utilisation of ICTs.

Paul thanked Anthony and invited **Victor Malewa, Deputy Director, Department of e-Government, Ministry of Information** to comment on Innovation and Entrepreneurship from a public sector point of view.

Victor outlined that within the public sector the provision and availability of eServices is a priority. Currently there are a number of innovations ongoing focused on cross-border control, eForestry as well as services to support the reform package. The Department of eGovernment are working with various Ministries to support the uptake of ICT as a horizontal enabler.

Paul thanked Anthony and invited **Bessie Nyirenda, Management Consultant, Malawi Institute of Management and Dr Harry Gombachika, Chief Executive Officer, Malawi Telecommunications Limited** to comment from a private sector point of view.

Bessie outlined that from the private sector's perspective innovation is seen as a way of leveraging technology to achieve efficiencies and competitiveness and as such, innovation is very important/ key to the survival of the business sector in the private sector. Innovation and talent identification, as well as management, is also key in the moving of the private sector in the right direction together with the public policies that are in place to support private sector growth. And so in light of technology, innovations and training, we see growth in co-created products and services as also key to promote private sector growth and this links to the fact, that we need to be able to promote idea generation and also link people to opportunities that are available so that they can grow their businesses. In relation to this, we see the growth of research and development labs around the world as something that Malawi could look into and leverage as a way of promoting innovation in the country to engage with the private sector to access knowledge resources and transfer as well as apply knowledge recourses for business growth. Bessie highlighted that knowledge is key to innovation and the creation of knowledge societies. Businesses, if they have to survive in the current sanctuary, have to embrace innovation in terms of making sure that their processes are reformed to match current trends, current technological trends, and to make sure that they provide relevant services as well as products that are demanded by the public. So they undertake research on what people want and then provide services in relation to the environment that you are in, as opposed to maintaining provision of services in the way we have always done. It is necessary to move with the current trends and current technological advances that are there in order to streamline business processes and take advantage of technology offering to provide the right services and the right products in the market place.

Dr Harry Gombachika (MTL) outlined that from the service provider's perspective we need to look at the demands in the telecoms business to see where innovations come in, specifically the availability of incubators or innovation spaces. Firstly, if you look at the telecom operator these days - the first challenge is there is a demand from the customer for high speed but almost free services. The second challenge is that technology moves fast, and equipment needs to be replaced almost every three years with regular repairs ongoing. Thirdly, the shareholder is demanding a return on investment. On the other side, traditionally the telecom industry has been vertically integrated, which means as an operator, they are doing everything: from infrastructure, services and even innovation. Harry outlines that a number of steps are necessary to address these challenges. First, we need to invest on the first challenge, obviously there is a need for telecoms operators to be innovative in order to provide higher speed connectivity at low cost, meeting the demands of the shareholder using the equipment

that expiring for almost three years, so we need to be very innovative. Secondly, open up the infrastructure side, the service side and the innovation side. In one of the aspects of Cloud computing MTL intends to provide infrastructure as a platform for innovation which means we need to attract these young, 18 to 25, 30 years old, provide them with a platform on which they can experiment with their ideas and maybe some of their products or services will move on. The next part of it is to do with financing. Most entrepreneurs require financing. If the idea is good and makes business sense, there are investment houses in Malawi that are looking for investment opportunities. One of the challenges facing incubators is knowledge ownership - it is necessary to strengthen our intellectual property rights governance,

Paul thanked Bessie and Harry for their insights.

Regulatory Environment

In the context of ICT-enabled services with cross-border potential and the need to continue supporting both national and regional Innovation (including challenges such as CyberSecurity, Internet Regulation and Open Data), Paul invited the panel to discuss how the demands on the Regulatory Environment can be best addressed.

Paul invited **Andrew Kumbatira (MACRA)** to kick start the dialogue.

Andrew highlighted that the Internet has compressed the whole world into a global village. And so what is done within Malawi and outside Malawi has an effect on us and what is done in Malawi has an effect across the borders. As a result issues of harmonisation come into play, which requires a lot of collaboration among Member States as levels of development are at different stages and challenges to balance the local and international situation. It is necessary for the regulator to revise licensing framework as MACRA has done. At the moment an operator must run the network, have the physical infrastructure, the towers, support retail sales and everything. We have seen that that is also a barrier to entry, because newcomers have challenges to come into the market. And so MACRA is changing the licensing framework to a four-tier license (network facilities, network services, application services and content), which will not necessarily demand the operators to have a comprehensive license to cater for all the services. So for example, there will be a separate company simply running towers, and another company will just come and manage the network. So that if the new company wants to come into Malawi they do not need to invest in towers, they will just come and leverage the existing towers. Or if they want they can get four licenses for all the services, that would be a decision of the investor. The aim is to encourage sharing of resources to reduce capital costs. The Regional Communication Infrastructure WorldBank Project is trying to reduce the price of broadband to actually less than \$150 dollars. Initially it was \$1800, it came down to \$900, we are trying to bring that down to \$150, hoping that will do two things, the project itself bringing a virtual landing point in Capital Hill here in Lilongwe from the sea cable, that should expand capacity, meaning service level can improve, speed can improve, quality can improve, but also the price will come down. By the end of the year all should be in place, so that we have this Converged Licensing Framework. It is necessary to review the 1998 Act, as directed by the President recently. Together with the landing point under this project, within a short time Malawi will have the internal capacity to support things to happen.

In relation to Cyber Security in Malawi under the current sitting of Parliament, which started on 05 May, a the "eTransactions" bill is going to be passed, which is establishing among other things the CERT (Cyber Emergency Response Teams) for Malawi, which does not currently exist. In terms of cross-border issues, the issue of Cyber Security is critical for Malawi and MACRA hopes that once the Act is passed it will help to establish the necessary structures in order to deal with that challenge.

In terms of collaboration, MACRA has collaborated with University of Malawi and Universities outside Malawi to develop Television White Spaces. This is a very innovative way of using spectrum to accommodate both television and broadcasting. Using those kind of initiatives – collaboration with universities, then you make cheap reliable fast internet available to rural areas, which then can be used for the kind of initiatives in education, in health and other services. At the moment MACRA and Chancellor College have established these facilities in the number of secondary schools around Zomba to experiment with the use of white spaces to provide Internet connectivity. This is innovative as it the collaboration between the regulator and a University.

Paul thanked Andrew and invited **Victor Malewa (e-Government Dept)** to comment.

Victor outlined that the dialogue in relation to Cyber Security has commenced with MACRA and he expects developments in the near future.

Paul thanked Victor and invited **Souhila Amazouz (AUC)** to comment.

Souhila highlight that the African Union Convention on Cyber security has been adopted and now needs to be ratified. The Convention of the African Union embodies all aspects of securing Cyber space: protection of personal data, electronic transactions, combating cyber crime and securing the networks. A lot of consultation was undertaken with a wide variety of stakeholder groups over four to five years before it was agreed to be adopted by the Member States. It is a tool that African countries can use to harmonise and establish legislation at regional level in order to facilitate and permit the development of the eApplications and eServices. The AUC believes that by transposing the convention in the national laws we can get harmonised laws, because right now there are only few countries that have established

their national strategy on Cyber security. Some countries have established some Cyber legislation, but mostly related to Cyber crime, other countries focus only on the technical tools, such as establishing the CERTs. But not all of the countries consider Cyber security in a comprehensive and holistic manner. The AUC believes that the Governments should commit themselves and consider Cyber security at high level and establish the national authorities, which may consider all the stakeholders inside the country. They also believe that by adopting this convention it will be possible to achieve a regional position for African countries. Now there is an international debate on Cyber security, where countries in general are requested to establish the responsible behaviour in ICT. To do this we believe that African countries should commit themselves in order to secure the Cyber space.

Paul thanked Souhila and invited **Dr Harry Gombachika (MTL)** to comment.

Harry outlined that to address Cyber security MTL as an operator shares information on abnormal traffic patterns that is being generated from the source within the country or even outside. Once MTL identify those they share that information and block those sites or if there are sim cards or some numbers block them too. Secondly, MTL intends to create some pseudo sites that appear to be legit so that they attract potential Cyber crime. This allows them to proactively identify who could sabotage their networks and block them.

Paul thanked Harry for sharing this insight into practical measures being undertaken.

Mobile Application Development

Paul outlined that we are all aware of the critical importance in an African context of mobile access to Information Society related public and private sector services in areas including banking, agricultural market data, education and health. The migration to Digital Broadcasting also opens new opportunities for local content development, particularly leveraging Open Data. Paul invited the panel to discuss how the Entrepreneurial spirit that already exists in Africa be fostered around Mobile Application Development, local content development and aggregation of content.

Paul invited **Andrew Kumbatira (MACRA)** to kick start the dialogue.

Andrew highlighted that a flexible regulatory environment that encourages creativity and investment to develop local content is key. At the moment MACRA is promoting broadband penetration in the country. However they have identified that due to the literacy levels of some people they do not really interact well with the language and the content that is there. It is therefore necessary to look at developing local content that addresses the needs of people that want to have access to internet. The regulatory framework or the legislation should be available to secure or to encourage production of local content. It is necessary to look at how the output can be patented or protected so that people can then see value in the innovation and get economies out of it. It is necessary to develop a flexible regulatory framework that accommodates creativity, innovation and protects the work that people have done. This is what Malawi is trying to achieve. At this stage it is really an issue of developing local content - promoting innovation to have local content available both on internet and also via television broadcasting for after Digital Migration on 17th June. Andrew concluded by saying that it is necessary to ensure that when people get this beautiful signal, they are also getting content that is relevant to them.

Paul thanked Andrew and invited **Dr Harry Gombachika (MTL)** to comment.

Harry outlined that from the corporate perspective the first point of departure is to allow entrepreneurs to provide services through the network and the second is to provide a mediation point through which these entrepreneurs can interface with our network., e.g. the GSM network where there are already value added services.

Paul thanked Harry and invited **Victor Malewa (e-Government Department)** to comment.

Victor highlighted that the Government intends to utilise mobile facilities and reaching out to the rural communities. eServices require a computer or some kind of computing facility. He outlined that they need to explore mobile services to provide sectoral solutions (e.g., agriculture, education, health) so that it is possible to reach out to more people using the various mobile facilities that are available (mix of feature phones and smart phones).

Paul thanked Victor and invited **Dr Paulos Nyirenda, CEO, SDNP** to comment.

Paulos highlighted that mobile access now enables us to collect a lot of data in addition to access resources. The ease with which we can collect data in the Information Society means we can generate a lot of content and collect what is called big data on our markets, on our head-systems, on our education systems and so forth. This is an advantage as it increases the knowledge that we have on our society. But it also creates a challenge as we need innovative ways and tools for managing, manipulating and accessing such big data. Africa in this sense has shown quite a bit of innovation in managing mobile access to such data as banking, mobile money, Mpesa and in Malawi Airtel money, Africa leads the technology world in innovative ways of handling such data. So this is one

of the areas that we could quite a bit of research. Mobile technology raises the other side of the issue – how fast can you access the data? And mobile technology at the moment is not really well suited for efficient or effective ways of accessing big data, so this again is another area for research and innovation in handling mobile phone access. Paulos raised the issue of who owns this data. In this case identity services are very important. We need to know who owns the data and who is accessing the data. To do this in the internet world we need to have good Registries for identity services, domain names, IP addresses etc. Africa is lagging behind in these areas, in constructing registries that are efficient. Our registries in Africa for domain names and IP addresses are still unsustainable, they are small compared with the rest of the world and they are not fully automated. Paulos concluded by suggesting that this is one area where Africa really needs to work in order to be able to effectively use the big data that we can generate from mobile access to our community as well as mobile access to our services and information.

Paul thanked Paulos and invited **Souhila Amazouz (AUC)** to comment.

Souhila referred back to utilisation of spectrum. Right now most African countries are in a challenging situation to switch off analogue services by the ITU deadline of June 2015. Souhila suggested that countries should give more importance to spectrum management, due to the scarce and vital resource for development of wireless services. Also at African level there is a project of harmonisation and utilisation of digital dividend in order to avoid harmful interference at borders. But it's important to review the spectrum management practices and to optimise the utilisation of the spectrum because sometimes we allocate free bands to operators and they don't use all of it, they don't use it efficiently, so maybe we have to modernise the spectrum management practices and to accommodate new technologies and to think about sharing of spectrum, because now we are moving to the commercialising of technologies and we are asked to make sharing of spectrum. Souhila indicated that we have to give more importance to this resource.

Paul thanked Souhila for this insight.

Skills Gaps

There is a significant skills gap in many countries (in particular in the area of 21st Century Skills such as analytical, business and ICT skills). There are different views in relation to whether there is a mismatch between the capacity of graduates and the requirements of both public and private sector employers. Paul invited the panel to discuss concrete actions that can be taken to better align third level curricula (including a commitment by HEIs to support entrepreneurship and engage with local communities through Action Research) to attract necessary FDI (Foreign Direct Investment) and accelerate the development of the Information Society and Knowledge Economy in Africa.

Paul outlined that the panelists had had a very useful and interesting discussion last night where we all recognised that there is often a significant mismatch between the capacity of graduates and the actual requirements of employment in either the public or the private sector let alone to be able to create your own business. Given the short time remaining Paul invited the panel to focus on concrete actions that can be taken and invited **Souhila Amazouz (AUC)** to kick start the discussion.

Souhila Amazouz (AUC) highlighted that ICT skills or digital competencies are now required in all sectors. With digitisation ICT is a crosscutting tool and we need ICT skills to do any job. Nowadays some young people face challenges due to low digital skills. Souhila suggested that Universities and schools in general should adapt themselves to the new digital era and include an ICT curriculum even at primary school in order to better prepare students for the workplace. She also suggested that to ensure equal access to the technology we should think about remote areas and establish capacity building centres in order to provide people with skills and qualifications in order to access information and knowledge.

Lonely Magreta (Secretary for Education, Science and Technology) proposed that there is a need for collaboration between Higher Education Institutions and industry in relation to curriculum development, especially industries that work on the development of ICT, so that the knowledge produced in institutions of higher education should accelerate the development of Information Society and Knowledge Economy. It is important to provide skills that address the needs of the society not simply produce graduates. Secondly, there is a need for linkage between Higher Education Institutions and local communities, for example, in terms of curriculum development in public Universities we are emphasising that the community is brought onboard so they can contribute to the curriculum being developed for outreach programmes. Through this project the community is learning best practices from the research on toilet design, water and sanitation. Also there is need for collaboration between institutions and international communities, especially in terms of support to curricular review or development, which could be in the form of technical assistance or even financial support. When this linkage is encouraged we will be able to address society needs.

Dr Pascal Hoba (UbuntuNet Alliance) proposed that a proper quality assurance system needs to be put in place at institutional level with a self assessment exercise every year at the universities and at national level. A quality assurance body at the national level could also put tools and mechanisms in place to assess universities and curriculum to make sure that those curriculum match with the reality of the market. In some countries they have experimented with good results in leveraging a tripartite agreement: government, universities and the private sector.

The Government can give some guidelines and incentives, Universities should accept to revise the curriculum and the private sector contributes to the curriculum designs so that the curriculum meets the requirements of the private sector and the companies. Pascal highlighted a regional initiative, which is very encouraging that includes a mobility programme which helps to fill the gap. Student can also move from one university to another one, so that clearly they can learn from other area, and other country. It required some minimum credit transfers to be put in place so that the best universities and best curriculum can be recognised easily in the university community.

Victor Malewa (eGovernment Department) highlighted an example of a partnership with a University in Mangochi where students are given incubator projects to work on and they also made an assessment of the kind of ICT costs required to run the programme. He proposed that a close collaboration between the public sector and Universities in terms of internships and exchanges would be helpful.

Bessie Nyirenda (Malawi Institute of Management) highlighted share the experiences of Malawi Institute of Management Post graduate students where their research is related to the experiences at their work places, so they can apply what they have learned through research to their work environment and then make recommendations to the organisations in the way of improving their business processes to achieve the desired efficiencies. Bessie also suggested that it is necessary to develop a national system for absorbing graduates that cannot get employment into incubator hubs where they can apply their knowledge gained and channel the spirit of innovation into entrepreneurship.

Dr Harry Gombachika (MTL) suggested that one of the challenges is the time lag between the curriculum consultation and the time graduates leave the university.

Transition to the Information Society and Knowledge Economy

Paul invited the panel to discuss who needs to champion the transition to the Information Society and Knowledge Economy.

Ideas discussed by the panel included the critical role of Government to champion this by providing the necessary environment through policy changes hand in hand with implementers, regulators and NRENs who can support realisation of the national vision. This can be supported by a task force or committee who can engage with different stakeholder groups.

Conclusion

In closing the session Paul thanked the Minister for honouring us with his presence and listening carefully to the issues that were discussed and to the panelists for sharing their insight and knowledge.

Scientific Programme

The Scientific Programme incorporated 33 thematically focused parallel sessions featuring different aspects of International Cooperation, eHealth, eInfrastructures, Technology Enhanced Learning and ICT Skills, Digital Libraries, ICT4D, eAgriculture, eGovernment and Cyber Security. The sessions were well attended with a good level of discussion and knowledge sharing. All published papers will be available in the IST-Africa Paper Repository in late June.

The **IST-Africa Workshop** showcased **ICT Initiatives and Research Capacities** in Malawi, Mozambique, Namibia, Botswana, South Africa, Mauritius, Swaziland, Lesotho, Tunisia, Egypt, Senegal, Kenya, Uganda, Burundi, Tanzania and Ethiopia to raise awareness of ongoing activities and to promote national institutions with capacity to participate in upcoming LEIT and Societal Challenges calls under Horizon 2020. This mapping of research expertise to Horizon 2020 areas provides input into the planning for future Work Programmes. Delegates took the opportunity to ask the IST-Africa partners for more details in specific areas of interest. Stephane Hogan presented "Defining Joint EU-Africa priorities - An Opportunity for ICT Collaboration?" to showcase African participation to date in Horizon 2020. The IST-Africa partners who are National Contact Points for Horizon 2020 introduced themselves so delegates could follow up with them during the event in relation to including partners from their respective countries in upcoming Calls.

Paper sessions on Wednesday afternoon included eHealth, Technology-enhanced Learning and eGovernment.

On Wednesday evening there was a Conference Dinner supported by MACRA to facilitate in-depth networking

and partnership building.

The Scientific Programme on Thursday incorporated tracks on International Cooperation, ICT4D, eHealth, Technology-enhanced Learning, eGovernment and eInfrastructure showcasing ongoing research being undertaken in Africa and Europe.

The **eInfrastructures Workshop** showcased achievements under the AfricaConnect project and new activities commencing under the Sci-GaIA, Magic and TANDEM H2020 eInfrastructure projects.

The **Impact Assessment in ICT4D projects Workshop** was organised by Nelson Mandela Metropolitan University as an interactive workshop to raise awareness of when to do Impact Assessment, Types and combination of methods and cases from running projects.

The **Supporting Life Workshop** shared results to date from their FP7 eHealth project based on research undertaken to date in Malawi to support electronic-based Community care management for childhood illnesses.

The **ICT Initiatives in Malawi Workshop** provided an opportunity for delegates to learn more about the depth of ICT Initiatives currently ongoing at national level including regulatory initiatives being undertaken by MACRA to increase ICT penetration, status of Digital Migration, eInfrastructure developments, eHealth projects being supported by the Ministry of Health and ICT Initiatives supporting development.

The **Mobile GraphoGame Solution to Global Illiteracy Crisis Workshop** showcased the GraphoGame online service which was originally developed in Finland for children with dyslexia and have been expanded to improve literacy instruction. This tool which is supported by the Ministry of Education and Culture, Finland has been leveraged in Zambia, Namibia, Tanzania and Kenya. Results from the work ongoing in Zambia was showcased.

The **IST-Africa Workshop** showcased **ICT Initiatives and Research Capacities** in Mauritius, South Africa, Botswana, Swaziland, Namibia, Lesotho, Malawi, Mozambique, Angola, Tunisia, Egypt, Senegal, Cameroon, Kenya, Uganda, Burundi, Tanzania and Ethiopia to raise awareness of ongoing activities and to promote national institutions with capacity to participate in upcoming LEIT and Societal Challenges calls under Horizon 2020. This mapping of research expertise to Horizon 2020 areas provides input into the planning for future Work Programmes. Delegates took the opportunity to ask the IST-Africa partners for more details in specific areas of interest.

The Scientific Programme on Friday incorporated sessions on eAgriculture, ICT Supporting Innovation, Digital Libraries, eInclusion and eInfrastructure, which shared research results and case studies from Europe and Africa.

Closing Plenary

The Closing Plenary Session of **IST-Africa 2015** was a panel focused on Innovation and Research Capacity Building in Malawi, which was well attended.

Paul Cunningham, IIMC/IST-Africa welcomed the delegates to the Closing Plenary and introduced the panelists: Martin B. Thawani, Malawi University of Science and Technology; Prof. George Kanyama Phiri, Vice Chancellor, LUANAR; Prof. John D. Kalenga Saka, Vice Chancellor, University of Malawi; Dr. Robert Ridley, Vice Chancellor, Mzuzu University and Dr Charles Mwansambo, Principal Secretary, Ministry of Health.



ICT Research Priorities in Malawi

Paul invited the panelists to discuss the main ICT related research and innovation priorities for Malawi from the education and research sector point of view.

Martin Thawani (Malawi University of Science and Technology) highlighted that research is prioritised in the areas of health, health networks and education research. Currently there is a move towards providing connectivity for educational institutions through MAREN as the NREN to support research and access to research data. **Prof. George Kanyama Phiri (LUANAR)** as a practitioner of agriculture outlined that this is the main research area in Malawi, which has now been extended to include food security, environment and climate change. ICT can assist in supporting extension workers and in addressing deforestation, which is a big challenge in Malawi. **Prof. John**

Kalenga Saka (University of Malawi) highlighted how ICT can be used to support land research, community communication and cloud computing. **Dr. Robert Ridley (Mzuzu University)** highlighted the need to increase the level of connectivity across institutions to support research. He outlined the huge potential for low-cost apps and technologies to support data collection, healthcare delivery, mapping of natural resources and community engagement. **Dr Charles Mwansambo (Ministry of Health)** highlighted the ongoing requirement to improve communication infrastructure in rural areas. He outlined this would help health management of malaria, waterborne diseases and HIV/Aids in remote areas.

Alignment of Research and Innovation Priorities with Policy

Paul invited the panelists to discuss how well aligned research and innovation priorities, such as the ones that we discussed, are with the existing body of strategy at a policy level (Universal Access, the National ICT Master Plan, Vision 2020 and the Malawi Growth and Development Strategies) in Malawi, given that the challenge in many countries is to align research and innovation to both inform and influence policy.

Dr. Robert Ridley (Mzuzu University) highlighted that there are few areas with the exception of health, where there are distinct research priorities. He outlined that NCST have been looking at research priorities in a number of areas. He observed that most scientists in Malawi are interested in undertaking research focused on addressing development issue and the challenge is to access funds to facilitate them to undertake the research.

Dr Charles Mwansambo (Ministry of Health) agreed that there were clear research priorities in the health domain which are aligned with policy based on sectoral needs. He believed that it would be advantageous for other sectors to also determine research priorities.

Prof. John Kalenga Saka (University of Malawi) outlined that there is a strong commitment to enhance wider access. As a result research undertaken within the University of Malawi is consistent with national policies and guidelines, so that the results can be used within communities and applied to address societal challenges.

Paul agreed that it was important to engage with communities and mentioned that in South Africa for example, part of the funding model for universities is the certain percentage of the budget of public universities is determined by their level of engagement with local communities and action research in solving local societal problems and things like that. Paul indicated that it would be a very public signal that that kind of public engagement is a critical part in the responsibility of the university sector.

Prof. George Kanyama Phiri (LUANAR) indicated that there is good linkage in the agricultural sector with the Ministry of Agriculture. There are sector wide approaches, which provide very useful instruments for disseminating and applying the outputs of research. This also fulfils the requirements of national policies and the Millennium Development Goals.

Martin Thawani (Malawi University of Science and Technology) mentioned that in addition to the issues outlined by the other panelists, there are priorities that are well-linked with the policies: Vision 2020, Universal Access and the Millennium Development Goals. They prioritise areas of connectivity and communication, agriculture and transportation. The end user or beneficiary is actually the “common man” in the village. So indeed these research areas that have been prioritised do actually align themselves with policies that are documented at national level and at government level.

Research Cooperation between Public Sector and Higher Education Institutions

Paul invited the panelists to discuss the current level of cooperation in the areas of Research and Innovation between the public sector, the private sector and the education and research sector, how do the panelists feel this can be strengthened in practical terms and what would some of the potential benefits be, not just for the universities but also for the public and private sectors?

Prof. John Kalenga Saka (University of Malawi) indicated that there is a significant level of cooperation between the public sector and Higher Education Institutions (HEIs). Important examples include the research ongoing between MACRA (Malawi Communication and Regulator Authority) and the Universities, particularly on White Space Technology, and with Government through the e-government window, where there has been cooperation to support efficient and effective communication and management of data and information. It is important to be able to provide evidence or information to support the meteorological department in order to focus, to predict natural events or disasters but equally within the government sector. The Malawi Police Service, for example, requires systems or software in order to manage crime and other matters related to safety and security of the country. It is therefore important that there is a good platform for dialoguing as otherwise the relevance and value of Universities to the society and industry becomes very difficult.

Dr Charles Mwansambo (Ministry of Health) agreed completely outlining that in Malawi, most of the health-

related research is undertaken by the College of Medicine and the College of Nursing, which are institutes of Higher Learning. The research undertaken is both clinical and non-clinical, with most of the clinical work undertaken with patients in public health facilities. As a result it is a symbiotic relationship because while the institutions are getting easy access to research participants and a place where they can teach the students, the health facility has ready access to consultants and laboratory investigations which would otherwise not have been available if it was not a normal public facility. So there are strong collaborations which should be encouraged.

Dr. Robert Ridley (Mzuzu University) agreed that there is a strong willingness for collaboration and there are many examples. Other panelists have mentioned health and communications (MACRA). There is also energy where universities are continuously approached by the Ministry for input and similarly the tourism and water sectors. However, he indicated that it could also be strengthened. At present a lot of the interaction is around advice for policy and it is often directed at individuals rather than seeking an institutional collaboration. The value of seriously approaching institutions for collaborations as opposed to just individuals is an opportunity for some multidisciplinary input into those areas. He indicated that more could also be achieved if critical think tanks could be established around certain sectors and areas where the public sector and the academic sector get together just to think through what are the research priorities. The number of people even in academia who have PhDs and who have undertaken research is relatively small. He concluded that there is a greater opportunity for some strategic thinking around big research priorities that can be targeted and focused on and have a bigger impact on development that exists at the moment.

Martin Thawani (Malawi University of Science and Technology) outlined that collaborative research is indeed the way to go. For Malawi action research cutting across various subject areas and the professions targeting the user community and working with the user community is very important and can bring about the desired benefits.

Prof. George Kanyama Phiri (LUANAR) added that there are practical examples of how the Higher Education Institutions, the private sector and public institutions are working together. For example in the fisheries sector the Ministry of Agriculture and LUANAR (Lilongwe University of Agriculture & Natural Resources) are working hand in hand to capture information about stocks in lakes and rivers. There are also examples in the food security sector. While there is good collaboration ongoing, he also agreed with Dr Robert that there is still need for improvement.

ICT-related Research and Innovation Capacity

Paul invited the panelists to outline their appraisal of the ICT-related Research and Innovation capacity of their institutions right now and where they would like to see those evolve to, given the caveat that we all understand some of the constraints that they are under. So as Robert pointed out establishing a baseline at where we are now could help as in terms of moving forward.

Dr. Robert Ridley (Mzuzu University) outlined that academically Mzuzu University has quite a strong and developing baseline in ICT. They have an ICT Department, a Department of Library and Information Sciences, the Physics Department interfaces with ICT related issues and research and a Mathematics Department that specialises in cryptography, which is related to making it safe to transfer electronic information. This basis has also spread into other disciplines. They are now starting courses on health informatics and have a FP7 project ongoing which is led by an Irish university looking at the use of mobile technologies for treatment and integrated management of childhood illness. So, there is strong baseline and the opportunity to grow. In a coming year due to an African Development Bank funded project the University infrastructure should have facilitated a much higher Internet access and a good intranet system will be developed that will support eLearning and sharing of resources internally within the University as well as externally. So in the case of Mzuzu University there is a strong baseline in terms of human resource and a growing baseline of infrastructure. But it still needs to expand, there is the beginnings of potentially a really strong activity, but it is still critically dependant on just one or two individuals. In conclusion he indicated that it is necessary to get more people back with PhDs to really push the research agenda, but the University is making progress given the circumstances.

Martin Thawani (Malawi University of Science and Technology) indicated that his institution is a very University which only opened its doors to first intake last year. The operational programs currently are chemical engineering, metallurgy and material engineering, earth sciences, meteorology and climate sciences. In addition there are two Masters programs: Master of Science in Innovation and Master of Science in Entrepreneurship. Through these masters programmes they anticipate that a lot of research will be generated which will cut across all areas of science and technology. There is also an industrial research centre where staff are being recruit and they hope that it will be operational soon. Through a combination of the industrial research centre and masters programmes, combined with collaboration with industry, the desired synergies will be arrived at. They hope that MUST will be very instrumental in research areas that affect Malawi people. The library is a member of MARICO and therefore benefit from MAREN initiatives to strengthen interconnectivities that will support information and knowledge sharing. Martin concluded that MUST is putting the necessary systems in place to be able to tackle research issues.

Prof. George Kanyama Phiri (LUANAR) highlighted that ICT is heavily utilised in partnership with other institutions outside the country. For example LUANAR has a tripartite arrangement with Michigan State University to improve eLearning and a tripartite engagement with Indian universities. With the focus to meet the needs of many farmers

as possible LUANAR is applying ICT very effectively among the communities to share information.

Prof. John Kalenga Saka (University of Malawi) indicated that as a result of engagement from the Department of Computer Science, ICT is being used in strategic projects and moving from one level to another to participate but this can only be achieved if they participate in good research. University of Malawi has a track



record of joint projects, for example between the University of Oslo, funded by NORAD. Key departments include the Computer Science department, the Physics department, Maths and Statistics, Electrical engineering and electronics engineering at Malawi Polytechnic, and in relation to the development and application of software by the ICT Directorates] in the Colleges. There are a number of new programmes which catalyse post graduate research and aid participation in research, including the Informatics Masters and Masters in Bio informatics. These are joint programmes so that members from College of Medicine can come to the Chancellor College and vice versa as well as the Polytechnic. There was an initiative in the country that John highlighted as the establishment of a very good masters programme in the Malawi University of Science and Technology. Dr Harry Gombachika, the Director General of MTL, was the lead person in developing this MSc in Informatics, that looks at applications, software, engineering and , so forth. It is still to be rolled as MUST is to take leadership in that regard. However its implementation will require joint partnership from all the Universities, so that there is good value for that development. In conclusion John summarised that there are good developments within the country and beyond and we are committed to leveraging ICT.

Paul outlined that he was very pleased that Chancellor College (University of Malawi) is part of an mHealth proposal that was submitted to the Horizon 2020 ICT-39 call, which closed in the middle of April focused on ICT in Africa. There are four African countries involved in this initiative and it will be a very interesting research project if it is successfully funded. Paul indicated that the audience for the Vice Chancellors as also future international partners as a lot of delegates representing Universities from other African and European states, and that part the reason why they are participated in IST-Africa 2015 is that they are eager to learn more about what collaboration opportunities there are, how their skillset can compliment skillsets in Malawi and how partnerships can be built going forward. Paul proposed that funding under Horizon 2020 is a very intelligent way of funding Masters and PhD students so that instead of having to send the best and the brightest aboard and potentially losing them for several years they can undertake their studies at home while still keeping them motivated and working on interesting research.

Interdisciplinary Research

Paul invited the panel to discuss interdisciplinary research, which has come up a few times as a very important issue. George has made the point that food security and agriculture is very important, Charles could also say that healthcare is very important. Paul outlined that a challenge from the research point of view is that every time you use technology to improve the quality of healthcare delivery, you save the baby who would otherwise have died, you rescue a mother who didn't die in pregnancy, those are all very positive things, but we suddenly are into George's area, because that puts further pressure on food security, because now there are more people surviving, there is more demand on agricultural products, so the efficiency has to go up, there is also more demand on the education system. So in this context Paul outlined that all of these things are so intertwined it is sometimes difficult to now where one stops and the next ends.

Paul invited the panel to outline their perspectives in relation to what is the current level of interdisciplinary Research and Innovation in Malawi, whether this is between departments in the same institution or between complimentary institutions and what do they think needs to be done to strengthen the avenues for academics to participate in Research and Innovation to develop their careers.

Prof. John Kalenga Saka (University of Malawi) indicated that this is a very interesting area, because normally it begins with an individual to initiate a research agenda, seek funding wherever internally or beyond. John outlined that it is through this interaction that you begin to appreciate who is who within the country as well as beyond. And therefore, appreciating that there quite a number of his colleagues from the University of Malawi, it is the Vice Chancellor's office expectation that new links will be established to foster within the country and across the borders. It is necessary to develop, strengthen and build on the existing links, while also adding value

to what we are doing at present. For example if the research is focused on informatics it is important to look at the application domain - if it is agriculture, it is important to link with our sister university LUANAR, if it is medicine we know that Mzuzu University is working on this. Within the civil service infrastructure there is KISU community where there are colleagues working on various diseases there, so we need to work with them, have joint supervision - so that we can have good value for the time but also for resources. In conclusion John highlighted that since because some of the colleague in Malawi were trained in South Africa, the question is if you are being supervised at the PhD level by a Professor at UCT or Kwazulu-Natal how can the institution continue to built on that relationship.

Dr Charles Mwansambo (Ministry of Health) indicated that based on sitting on the ethics review committee for over ten years he has noted over the years the number of multidisciplinary and interdisciplinary proposals that are building up steadily. Previously it would be just individuals applying as Prof Saka said but now these researchers have seen the need and they know that there are some funders that prefer research originating from multiple disciplines as opposed just to one. One research proposal that he looked at recently was focused on the delay in diagnosing infants born to mothers with HIV and one key issue was turn around time of the samples. There is also a toy that people are commonly using, planes that you fly with the remote control (drones) so this is something that people are using as a toy. However if you have a problem, you can come up with the way of trying to use drones to improve your system. Charles outlined that there is a study that has been planned to use drones to ship specimens from the remote sites to centres where they can do the testing. And this is involving health experts, aviation, police and social scientists. Charles concluded that this is the type of the research that we need to be heading towards - this is just one example but there are many other areas including nutrition.

Taking up on Charles point, **Paul** outlined that EPFL in Switzerland has been doing some very interesting work for the past number of years with what they call "Flying donkeys". These literally are drones, that are designed to carry up to 50 kg from point to point and follow certain paths. The reason why that is important obviously is that in certain countries there is sensitivity about airspace, so for example in Kenya at the moment there is a lot of control over how you can use or not use drones in airspace even for humanitarian purposes. Paul indicated that obviously being able to use drones either to fly vital supplies or medicines to a location, or as John mention disaster management earlier, it would be possible to drop something critical to an exact point and then remotely send the drone back again, which is an opportunity to explore.

Martin Thawani (Malawi University of Science and Technology) indicated that as MUST is a new University the creation of the programmes in themselves generate opportunities for multidisciplinary research and masters also exploring avenues for the creation of partnerships and twinning with other similar universities, so that the research undertaken for Masters and PhD which are co-supervises will generate research that will cut across disciplines. This should lead to collaboration and concrete examples of research activities that are multidisciplinary in nature. MUST also has programmes lined up in health sciences, to support teaching in health services linked with a teaching hospital structure. MUST believes that links between engineering, climate sciences, meteorology, geology and health sciences will also assist in generating appropriate multidisciplinary research. By leveraging twinning and partnerships with other universities MUST believes that they will be able to create a rich environment for multidisciplinary research.

Prof. George Kanyama Phiri (LUANAR) outlined that there is a great deal of multi/inter disciplinary research going on at LUANAR. Three specific areas that he highlighted include I can cite three areas: collaboration in dairy research involving three universities in India, in US Michigan State and with Ministry of Agriculture in relation to fisheries. The "capacity building for managing climate change" (CABMACC) programme is working well in Malawi as a interdisciplinary collaboration involving several institutions: LUANAR, several government ministries, NGOs and the private sector addressing various areas ranging from climate change to soils. Another example is the "From Outreach to Engagement" project being undertaken by a Consortium of 42 Universities in Africa, LUANAR being one of them, to improve the reach to the farmers. The outputs of this collaboration has lead to a revision of curriculum, based on having a better feel for how to deal with the problems associated with engagement with farmers.

Dr. Robert Ridley (Mzuzu University) indicated that there are two aspects to the question of interdisciplinary: International and National. Robert illustrated a slide focused on a mapping of publications with African authors on HIV and AIDs undertaken 5 years ago - 97% of the partnerships were African-external: Africa to US, Africa to Europe. The number of internal collaborations within Africa was minimal and most of those involved South Africa. Robert proposed that while these partnerships are crucial for developing capacity, it is necessary to move to a system whereby the funding is not just depending on external resources, but somehow internal resources can be generated or funds can be made available to African countries to fund research internally. Those research questions will always be answering important questions, but it won't maybe have quite the same dynamic as if two researchers from Malawi, or researchers from Malawi and Zambia were talking to each other about the same problem, which may identify a different solution, a different way of undertaking the research. The other aspect that Robert focused on is the nature of interdisciplinary research itself. Robert proposed that interdisciplinary research is not justifiable in its own right. It is justifiable because it is necessary to address the question and the most important part in any scientific endeavour is to get the question right. The answer is often more straightforward than the question. If the research question is around issues such as healthcare or agriculture you automatically move into an interdisciplinary sphere to address

that question. Robert outlined that the responses that have been coming have been correct, but if researchers are serious about addressing the problem they automatically move into interdisciplinary mode. Examples have been given of the interdisciplinary research - some examples from Mzuzu University include ICT and health, community based research and food security etc. The nature of funding can enhance this type of approach. There is currently limited collaboration between the research institutions represented in this panel and this needs to be encouraged. The funding model under Horizon 2020 (EU) is focused on multi-country collaboration. To complement this funding opportunity it would be very beneficial if NCST could establish a fund to provide grants for inter university collaboration within Malawi. This would automatically strengthen interdisciplinary research, because LUANAR is focused on agriculture, College of Medicine is focused on health, that in itself will foster interdisciplinary research.

Martin Thawani (Malawi University of Science and Technology) confirmed that interdisciplinary research is very desirable. He shared a recent experience based on speaking to a person who just graduated at masters level with his research focus on research data. When research is ongoing there was good collaboration but when the research was complete, how is it accessible? This is generally a problem with research outputs. MAREN as the Malawi NREN propose to address this by creating a library of research outputs.

Paul followed on two points raised by panelists. One was the issue of the accessibility of research results, so called Open Research. In the academic sense Green Access means that it is possible for somebody to access a scientific paper without having to pay a charge for that. Under Gold Access, which is typically the model for publishers of journals who have to cover their costs, it is possible for the authors or for the institutions that the author belongs to pay a fee upfront and then that paper is made available to anybody who is interested. It is the way of accelerating wider access beyond the education and research sector. Paul agreed that these issues of Green and Gold Access are very important to talk about. He reminded the delegates that the IST-Africa portal has one of the largest repositories of scientific research from Africa and about Africa on an Open Access basis. Any member of the IST-Africa community, which is more 10,000 members that includes all the delegates, can go to the portal, log in and do searches for papers based on different areas wherever its energy, health, agriculture; and you can download these papers and the contact details for the authors are in those papers. IST-Africa believes that having access to that and rising the profile of research by Africa from Africa is extremely important. Paul highlighted that many of the delegates are aware that most of the 10 years of the conference proceedings are also available to IEEE Xplore, as this makes it accessible to a much wider audience in the international educational and research community. Paul reverted to one of the points that Robert made in relation to supporting collaboration. Paul outlined that it was clear that there are very good relationships, working in a pragmatic way and supporting one another where you can, but the challenge that he heard not just today, but also when talking to some of the panelists before the session, is resource constraints in terms of formalising these types of relationships. He provided an example from an Irish context. There is a government agency called Science Foundation Ireland which provides grants for large-scale innovative research undertaken within Centres of Excellence; so essentially there is a pot of resources, a challenge that is aligned with the national government policy in Ireland and SFI publish a tender to propose to host this Centre of Excellence focused on this strategically important topic from the national government policy point of view. However the only tender can only be awarded if the applicant has a representation from appropriate organisations within Ireland - for example the leading universities: Trinity College Dublin, University College Dublin, Dublin City University, University College Cork, University College Galway, University College Limerick etc. Furthermore it is a requirement that the proposal is a collaboration between the best researchers in that field between different institutions in Ireland. Paul suggested that if the Ministry can allocate some research funding to NCST, they could then look at this type of model as a guide in terms of how to facilitate and formalise these kinds of relationships.

Dr. Robert Ridley (Mzuzu University) also followed on from what Martin outlined in terms of challenges of accessibility and availability of research afterwards as this is a very important topic. The best way for academics to make their work accessible is to publish it. He indicated that people talk about grey literature and reports, but the reality is that the user has to hunt very hard for those sorts of things and even if they find them, since they have not been peer reviewed, it is not clear how valid the information is as it is often somebody's opinion. A lot of consultancy work gets done in Malawi for agencies and the Government with a lot of time and effort put into it, a lot of academic thought, a report is produced but it stays as a report. It is necessary to find some way of getting that work peer-reviewed, published and then it is more accessible. He indicated that he had been involved in some consultancy work with certain agencies, international agencies and government departments. When he requested that the agreement indicate that the findings would be free to be published even with reference back to the agency that funded the work, he has been told that this is not possible, which he considered to be very strange. Robert proposed that there should be a policy drive with the view to openness and transparency within the country so that work undertaken for the Government can ultimately be published by the academic who undertook the consultancy.

Paul reinforced what Robert said outlining that having a double blind peer review of research is very important: it establishes credibility, it facilitates replicability, and this ties back to what Martin was saying about having access to research results. Paul agreed that as a policy if it is possible to include a clause that even allows for certain information that may be sensitive to be kept back there should be a situation where should be possible to write up research results, get it peer reviewed, get it critiqued wherever in terms of methodology or in terms of interpretation of the results, so that it is more widely discussed.

Action Research

Paul invited the panelists to discuss if Action Research is formally leveraged by Master students or PhD candidates as a research method in Malawi. How could Action Research and Open Innovation be used as mechanisms for better research cooperation between the public sector, private sector, NGOs and HEIs to identify solutions to known challenges at national and regional level?

Prof. George Kanyama Phiri (LUANAR) indicated that the issue of action research is another thing that is at the cutting edge of the requirements these days. Action Research has its advantages and Masters and PhD students tend to acquire new knowledge and understanding of the issues that need to be addressed in the research. LUANAR has managed to engage with the farmers through Action research and the results have been very encouraging. Action Research also allows us to get good feedback from the stakeholders and provides opportunities for students to enhance their knowledge based on real circumstances and applied situations. The end-users in Action Research also benefit as they can acquire additional skills above and beyond the normal knowledge, to engage with different communities. George outlined that all this skills are valid and they are very important and vital for enhanced research through this particular method. In relation to the second question, George agreed that indeed Action Research and Open Innovation can be used as a mechanism for better research between the public institutions and various HEIs. Action Research can provide a way both for the public and the researcher to be involved in problem solving and to jointly identify solutions with the result that there is a better understanding of the information that we are looking for.

Dr Charles Mwansambo (Ministry of Health) outlined that as a Ministry they have a number of staff working on various programmes and this provides an opportunity for them to go to institutions of higher learning and collaborate through action research to address real problems for the health sector.

Dr. Robert Ridley (Mzuzu University) agreed that action research is a crucial area for research particularly in countries like Malawi. Some people call it operational research or implementation research or implementation science, so it is a crucial area and has potentially high impact. Mzuzu University has several examples of this type of research undertaken by Masters students. The challenge is that it is not possible for a large amount of research to be done in a country unless you have a lot of Masters students, PhD students, a lot of PostDoctoral Fellows. He indicated that Malawi is still struggling to move to a situation where there are large numbers of post graduates courses in operation so any substantiate research requires Masters courses, it requires PhD courses. There are some good examples of action research in the areas of water, sanitation, collaboration with communities, including collaboration with Mzuzu City council on issues around sanitation. Mzuzu University has started a Master's program out of a European funded collaboration with Maynooth University in Ireland and several African universities. It is called Transformative Engagement With Communities. It is based on transformative community development through engaging and the way that this works is that the students spend time in the communities, there is a discussion with the communities about the issues, the question is developed, the research is done around that and then there is the feedback of information back to the communities. The response to this programme has been staggering, with applications coming from within Malawi but also from Europe and the U.S because of the nature of this approach. Robert highlighted that this is area that is being recognised as being important across a whole variety of sectors and it is an excellent way for a country like Malawi to undertake relatively low cost research. It does not require super high technology to do it, the researcher needs an understanding and a collaboration with communities and different sectors. In relation to the second part around open innovation and sharing information, Robert indicated that this could be innovation linked to other technical developments discussed earlier about ICT. One area that has not been discussed much to date is whole issue of entrepreneurship. Robert highlighted that if you look across innovation and entrepreneurship in Africa as a whole, ICT is the prime driver of that maybe followed by health research and then agriculture. As a result there is an opportunity to link this to the issue of entrepreneurship. Robert outlined that there have some examples in Mzuzu University where several students have undertaken projects that have been so successful that they have actually been able to take those out and start up companies in their own right. Robert highlighted that obviously on the commercial level you have to balance open information with intellectual property, but that's another area where things need to be moving forward.

Paul provided some insights based on the situation in Irish Universities and some other European countries where it is more or less implied that if you carried out research as part of your studies, wherever it is undergrad or post grad, de facto the institution is the copyright holder or the holder of intellectual property. Then what typically happens, at his own alma mater – Trinity College Dublin, is that if a PhD student has something that can be commercialised, and Trinity is very good at commercialising research, there is a licensing agreement, where they will take either a certain amount of revenue out of that particular innovation that is generating some of the revenue for the business or they will

take percentage ownership stake in the company. Paul indicated that he likes the philosophy of giving ownership to the student, making the student responsible and supporting the student commercialise, which very much fits what he thinks is needed in terms of supporting open innovation, because what we trying to do here is to get people to be entrepreneurial, not trying to put barriers in the way to stop research being exploited.

Prof. John Kalenga Saka (University of Malawi) agreed that action research may need to be concentrated at a Master's degree level. He indicated that at PhD the University would be interested in what you are contributing to the knowledge. An IP policy is very desirable and work is underway. Interestingly, the TV White Space research which the Physics colleagues have been undertaking with MACRA, is a very interesting innovation, that the other TV stations are exploiting to add value to their communication. However one would require to have a clear research agenda and that information needs to be appropriately shared so that it can inform what you would like to do in ongoing exercises, otherwise it will become "one of those". John concluded that action research is very necessary and given the nature of the action research and innovations there is no restriction and the benefits should be shared appropriately.

Paul indicated that based on what John has shared it reinforces that it is important to have forums like this, where these type of issues can be raised and stimulate the discussion, both within institutions and also the motherships, so to speak, in terms of education science and research to come up with the policy fit for that purpose.

Martin Thawani (Malawi University of Science and Technology) indicated that In Malawi the priorities that have been set is actually to improve the living standard of the average Malawian. Looking at the percentages of those who access primary education, secondary education and tertiary education compared to the population at large it is relatively very small. If those who do research employ action research to address challenges among communities this should benefit the average Malawian.

Leveraging African Research Diaspora to build international research cooperation

Paul raised the topic of wider engagement with the African research diaspora. He outlined that Ireland has a population of 4.2 million people. Due to migration around the Great Family there are now seventy eight million people around the world who call themselves Irish. In one sense Africa has had the same curse and the same blessing having diaspora all over the planet, and many of those people now have taken up positions in well established institutions both from the public, private, education and research sector. Paul invited the panelists to discuss what opportunities they can see to leverage the African research diaspora to help build more international linkage cooperation and perhaps also look at the opportunities in terms of attracting key researchers who are now established abroad to come back home at some stage when resources allow

Dr. Robert Ridley (Mzuzu University) outlined that there is a huge potential with diaspora to assist and facilitate research. It should not be seen as a panacea solution, because often it is not so easy for somebody in a relatively high position outside to develop linkages back home and through research projects, but where it can happen it should be encouraged. He indicated that the real benefit happens more when people actually return than when they assist from outside. Assistance from the outside tends to often facilitate some small-scale actions and they are very beneficial and maybe they can make linkages for people for potential research funding. The real value comes maybe if the diaspora can either come back permanently at the end of their career or mid career or if they spend three to six months a year back in their home country. Then things could start to happen more seriously. He said that it would also be interesting to look at how to leverage professionals who retire and wish to contribute their knowledge through academia.

Dr Charles Mwansambo (Ministry of Health) agreed that it would be good to leverage the expertise of the Diaspora. There are also useful exchange programmes for African researchers to travel to other countries for training and knowledge exchange.

Martin Thawani (Malawi University of Science and Technology) highlighted that within Malawian academic institutions there are built-in mechanisms to allow for sabbatical leave. If researchers leverage this opportunity to undertake research work in other places, they can then come back and enrich the research work at home based on this wider experience.

Prof. George Kanyama Phiri (LUANAR) agreed that it was a good idea to leverage the diaspora but there may be a level of frustration when they realise that the research resources and equipment available at home are not at the same standard that they are used to abroad.

Prof. John Kalenga Saka (University of Malawi) confirmed that engagement is very necessary and important as it can catalyse a number of ventures. There has been positive news in relation to diaspora exchange visits in certain countries including Nigeria Ghana and Tanzania but to date this has not been leveraged very much in Malawi. It should be possible to engage diaspora as Adjunct Professor or Lecturer for 3-12 months

Paul thanked the panelists and invited the delegates to give them a round of applause. He invited **Lonely Magreta (Secretary for Education, Science and Technology)** to make the concluding remarks.

Official Closing Remarks

Lonely Magreta (Secretary for Education, Science and Technology) outlined that his has been a very exciting week for Malawi hosting the 10th Anniversary of the IST-Africa Conference.

The Living Lab Working Group Meeting on Tuesday focused on issues related to mHealth and ICT Entrepreneurship with more than 60 delegates from Africa and Europe. It demonstrated how Living Lab methodologies can be used to support Action Research and encourage greater Innovation cooperation between end user communities and public, private, Higher Education Institutions and NGOs.

The Opening Plenary on Wednesday morning provided insights into policy issues related to the Information Society and Knowledge Economy. The Roundtable was a stimulating discussion that highlighted a number of important issues at both national and regional level.

The Scientific Programme from Wednesday afternoon incorporated 34 parallel sessions, with over 160 presentations from 38 countries focused on International Cooperation, eHealth, Technology-enhanced Learning, eGovernment, eInfrastructure, ICT4D, Cyber Security, eAgriculture, Digital Libraries and eInclusion. These sessions were very interactive in nature with a high level of knowledge sharing. This is complemented by a high quality peer reviewed proceedings to ensure that interested parties can follow up with the authors after the event.

The Closing Plenary this afternoon focused on Innovation and Research Capacity in Malawi with participation from senior leadership of the main Higher Education Institutions, Ministry of Health and Ministry of Agriculture.

Lonely acknowledge dthe support provided by the European Commission, African Union Commission, MACRA, Skyband and MTL towards the IST-Africa 2015. She thanked Gift Kadzamira, Ebony Mzikawanthu and colleagues in NCST, who collaborated closely with IIMC to ensure that the IST-Africa 2015 is a success. She thanked the IST-Africa Coordinators, Paul Cunningham and Miriam Cunningham for selecting Malawi to host the 10th Anniversary of IST-Africa Conference, indicating that they had learnt a lot from the experience.

She hoped that the delegates enjoyed their time in Malawi, the warm heart of Africa and will continue to engage and collaborate with Malawi researchers in future proposals submitted under Horizon 2020.

Awards

The Awards for Best Paper and Runner-up Paper were announced by Anthony Muyepa-Phiri, DG, NCST and presented by **Lonely Magreta, Secretary for Education, Science and Technology** during the Closing Plenary Session of **IST-Africa 2015**.

All papers submitted to IST-Africa are double-blind peer reviewed by members of the International Programme Committee. As part of this process the reviewers nominate a shortlist of papers to be considered for the Best Paper and Runner-up Paper Awards.

A Special Award was provided to the “TV White Spaces” team (Physics Department, Chancellor College and MACRA) for the innovative work ongoing in Malawi

The Best Paper was awarded to “Assessing the Use of Mobile Technology to improve Timeliness of HMIS Reports in Malawi”, authored by Christon Moyo, Tasokwa Nkhonjera, both from Ministry of Health Malawi, Jens Kaasboll of University of Oslo, Norway.

The Runner-up Paper was awarded to “Towards an ICT Framework to Support a Patient-Centric Approach in Public Healthcare: A Case Study of Malawi” authored by Richard Pankomera and Darelle van Greunen of Nelson Mandela Metropolitan University, South Africa.

Acknowledgement of Support

Anthony Muyepa-Phiri, DG, NCST highlighted that from the perspective of the National Commission for Science and Technology, **IST-Africa 2015** have been a very big success. He thanked Hon. Emmanuel Fabiano the Minister of Education Science and Technology and Lonely Magreta, Secretary for Education, Science and Technology for their support. He thanked MACRA for providing a beautiful Networking Dinner on Wednesday evening, Skyband for providing Internet connectivity and MTL for communication support.

He thanked the presenters and delegates for coming and actively engaging for the four days of the event. He believed that the outcome that have been presented, the networking that



took place, will give us the urge to move forward as we are moving Malawi toward what we call the Information Society and technologies country. It is important to leverage ICT for social-economic development and to have stakeholder engagement with and between the public sector, private sector and academia. He wished the delegates a safe trip home.

On behalf of IST-Africa Paul thanked our partner the National Commission for Science and Technology for hosting **IST-Africa 2015** in such a professional and warm way and for all the work undertaken in Malawi to prepare for the event and mobilise the national research community. This is provided an important opportunity for all national stakeholders to come together and share knowledge within the country as well as the colleagues from another 38 countries around the world. He hoped that as result of **IST-Africa Week** that the Malawi research community will leverage this opportunity to follow up with delegates from Europe and as well as from other African Member States to prepare future research and innovation projects for submission under Horizon 2020 and under African Union Commission calls and hopefully very soon research calls in Malawi as well. He highlighted that he would particularly would like to acknowledge all the hard work undertaken by Gift, Ebony and Anthony in preparation for this event. He also thanked the entire NCST including Ellen, Kondwane, Yamikani, Yamikani Phiri, Mphatso, Tiwonge. Cathrin and all the other members of staff who assisted and made your lives so easy over the last couple of days. He thanked the Honourable Minister, Lonely, Andrew from MACRA, Bram from Skyband, Harry from MTL for all of their support. It is important to thank the European Commission and the African Union Commission for their ongoing support. He invited the delegates to give a warm round of applause and thanks to the International Programme Committee members, who undertook a vigorous double blind peer review and assisted authors in preparing quality scientific papers for publication. He also thanked all the session chairs for ensuring truly interactive sessions and knowledge sharing and thanked the delegates and presenters for their active participation. There has been an excellent atmosphere, no more that he would expect from the "Warm Heart of Africa" throughout the event, which has facilitated old friends and hope now new friends to meet and build new networks. He wishes the delegates a safe travel home and looks forward to seeing them next year.

Participants

There were over 400 participants at **IST-Africa 2015** from 39 countries (Europe, Africa and Chile). The organisations represented are listed below.

European Organisations

Organisation	Country
DG CONNECT, European Commission	Belgium
CZ.NIC Association	Czech Republic
Technical University of Denmark	Denmark
Tallinn University	Estonia
The Pharmacy of Kaivopuisto	Finland
University of Helsinki	Finland
University of Jyväskylä	Finland
VTT	Finland
CIRAD	France
IRD	France
Orange Labs	France
RENATER	France
University of Koblenz Landau, Campus Landau	Germany
GRNET S.A	Greece
IIMC Ltd	Ireland
University of Milan	Italy
eGovLab	Sweden
Stockholm University	Sweden
Development Dreamers Ltd	United Kingdom
Institute of Development Studies	United Kingdom
University of Oslo	Norway

African Organisations

Organisation	Country
Universidade Agostinho Neto	Angola
Ministry of Transport and Communications	Botswana
Ministry of Higher Education and Scientific Research	Burundi
National Agency for Information and Communication Technologies (ANTIC)	Cameroon
University of Ngaoundéré	Cameroon
ITIDA	Egypt
African Union Commission	Ethiopia
European Commission	Ethiopia
Ministry of Communications and Information Technology	Ethiopia
Wollo University	Ethiopia
UN Economic Commission for Africa	Ethiopia
Accra Polytechnic	Ghana
Dedan Kimathi University of Technology	Kenya
Kabarak University	Kenya
Kenya Human Rights Commission	Kenya
Kenyatta University	Kenya

Organisation	Country
Ministry of Education, Science and Technology	Kenya
Ministry of Health	Kenya
Moi University	Kenya
Murang'a University College	Kenya
The Catholic University of Eastern Africa	Kenya
The Technical University of Kenya	Kenya
University of Eldoret	Kenya
University of Nairobi	Kenya
USIU	Kenya
Department of Science and Technology	Lesotho
Limkokwing University of Creative Technology	Lesotho
National University of Lesotho	Lesotho
Account General Department	Malawi
African Development Bank	Malawi
African Institute of Corporate Citizenship	Malawi
Baobab Health Trust	Malawi
Carewise Charity Organisation	Malawi
Chancellor College - University of Malawi	Malawi
College of Medicine, UNIMA	Malawi
Department of eGovernment	Malawi
Department of Human Resource Management & Development	Malawi
D-tree International	Malawi
Embassy of Japan	Malawi
European Union	Malawi
Government Wide Area Network Department	Malawi
Havoc Aid	Malawi
ICT Association of Malawi	Malawi
I-TECH Malawi	Malawi
Kamuzu College of Nursing - University of Malawi	Malawi
Lilongwe University of Agriculture & Natural Resources	Malawi
Lingu	Malawi
Luke Internatioanal Malawi	Malawi
Malawi Communications Regulatory Authority	Malawi
Malawi Institute of Management	Malawi
Malawi Savings Bank	Malawi
Malawi Telecommunications Limited	Malawi
Malawi University of Science & Technology	Malawi
Ministry of Education, Science and Technology	Malawi
Ministry of Agriculture and Food Security	Malawi
Ministry of Finance & Economic Development	Malawi
Ministry of Health	Malawi
Ministry of Home Affairs	Malawi
Ministry of Information, Tourism & Culture	Malawi
Ministry of Lands & Housing	Malawi

Organisation	Country
Ministry of Transport	Malawi
Moyo Wanga Private Clinic	Malawi
Mzuzu University	Malawi
National Audit Office	Malawi
National College of Information Technology	Malawi
National Commission for Science and Technology (NCST)	Malawi
National Council for Higher Education	Malawi
National ICT Working Group	Malawi
National Library Services	Malawi
NICO Technologies	Malawi
Office of the President and Cabinet	Malawi
Office of the Vice President	Malawi
Reserve Bank of Malawi	Malawi
Sustainable Development Network Programme (SDNP)	Malawi
Shekinah Invest	Malawi
Skyband	Malawi
Telekom Networks Malawi Limited (TNM)	Malawi
The Polytechnic, University of Malawi	Malawi
Trócaire	Malawi
UbuntuNet Alliance	Malawi
UNESCO	Malawi
University of Malawi	Malawi
USAID	Malawi
National Computer Board	Mauritius
University of Mauritius	Mauritius
INTIC	Mozambique
National Institute for ICT	Mozambique
Pandora Box, Lda.	Mozambique
NCRST	Namibia
Polytechnic of Namibia	Namibia
WACREN	Nigeria
Girl Hub	Rwanda
Central University of Technology	South Africa
CSIR	South Africa
Department of Science and Technology	South Africa
Durban University of Technology	South Africa
Meraka Institute, CSIR	South Africa
Nelson Mandela Metropolitan University	South Africa
Rhodes University	South Africa
Siyakhula Living Lab Project	South Africa
Tshwane University of Technology	South Africa
Unisa	South Africa
University of Cape Town	South Africa
University of Fort Hare	South Africa

Organisation	Country
University of Johannesburg	South Africa
University of Pretoria	South Africa
University of South Africa	South Africa
Sudan University of Science and Technology	Sudan
Ministry of Information Communication Technology	Swaziland
COSTECH	Tanzania
Moshi Co-operative University	Tanzania
TanzICT Programme	Tanzania
University of Dar es Salaam	Tanzania
Ministere de l'Enseignement Superieur et de la Recherche Scientifique	Tunisia
Health Marc Limited	Uganda
Makerere University	Uganda
Uganda National Council for Science & Technology	Uganda
University of Zambia	Zambia
Zambia National Union of Teachers	Zambia
Midlands State University	Zimbabwe

Other Countries

Organisation	Country
RedCLARA	Chile