SCHOOL OF INFORMATION & COMMUNICATION TECHNOLOGY
FEDERAL UNIVERSITY OF TECHNOLOGY,
MINNA, NIGER STATE, NIGERIA

International Conference
ON INFORMATION AND COMMUNICATION TECHNOLOGY AND ITS APPLICATION (ICTA 2016)

Proceedings

Theme: INFORMATION AND COMMUNICATION TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT

Held at

School of Information and Communication Technology Complex, FUT, Minna.

Date:

28th - 30th November, 2016

Editors

Dr. H.O Salami
Mr. Oluwafemi Osho
Dr. A. J. Onumanyi
Dr. Olaniyi Mikail
Mr. Michael Okwori
Mr. Hussein Zubairu
Dr. Richard A. Ikuesan
Dr. Shafi'i M. Abdulhamid
Dr. Ismaila Idris
Dr. G. A. Babalola
Mr. Ibrahim S. Shehu
Mr. Suleiman Ahmad

Proceedings of the

International Conference on Information and Communication Technology and its Applications (ICTA 2016)

28th – 30th November, 2016
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FOREWORD

It is a great pleasure for me to welcome you all to the maiden edition of the International Conference on Information and Communication Technology and its Applications (ICTA, 2016), hosted by the School of Information and Communication Technology, Federal University of Technology, Minna, with the theme: ICT for sustainable development.

No doubt, ICT has pervaded virtually every facet of human existence, and with its reach, richness and performance holds great promise. However, there still abound numerous and diverse developmental challenges in our society that can and should be addressed through the deployment of necessary ICT functionalities and tools. To this end, ICTA 2016 is geared towards providing opportunity for researchers and developers, in academia and industry, to explore their innovative ideas. Technical sessions are organized to foster discussions and sharing of experiences in the fields of computer science, cyber security science, information and media technology, library and information technology, telecommunications, computer, and electrical engineering, and other cognate areas.

In response to the call for submission, a total of 84 papers were received. The papers were subjected to rigorous reviews, with each receiving a minimum of two reviews. Out of these, 42 papers (making an acceptance rate of 50%) have finally been accepted for presentation at ICTA 2016 and included in the Proceedings. The Conference Organizing Committee sincerely believes that the accepted papers will indeed serve as a needed catalyst for sustainable development.

On behalf of the Conference Organizing Committee, I graciously appreciate all the reviewers for their dedication to the review process. We hope that you have a wonderful and fruitful time at the Conference.

Dr. I. Idris
Chairman, Conference Organizing Committee

PROFILES OF KEYNOTE SPEAKERS

Prof. 'Sola Aderounmu, *FNCS*
President, Nigeria Computer Society (NCS)

Adesola Aderounmu, a Professor in the Department of Computer Science and Engineering, Obafemi Awolowo University, Ile-Ife, Fellow of Nigeria Computer Society, Registered Professional Engineer with Council for Regulation of Engineering in Nigeria (COREN). Professor Aderounmu received his B.Sc. Degree in Computer Engineering and M.Sc. Degree in Computer Science from Obafemi Awolowo University, Ile-Ife in 1991 and 1997 respectively. He became a Professor in the Department of Computer Science and Engineering in 2008, seven years after he bagged his PhD. Degree in Computer Science from the same University. Aderounmu worked briefly with Chams Nigeria Ltd. (Now Chams Plc.) before he joined the services of the Obafemi Awolowo University, Ile-Ife in 1993. He was appointed Acting Head of Department of Computer Science & Engineering between 2004 and 2007, Deputy Director, Information Technology and Communications Unit, 2005 – 2008, Acting Director, Information Technology and Communications Unit, 2009 -2011 and Full Director, 2011 to date. He is a member of the Screening and Monitoring sub-committee of Tertiary Education Trust Fund (TETFUND) research fund. He served as a member of curriculum development for National Open University of Nigeria, member COREN, CPN and NUC accreditation team respectively to various universities in Nigeria. Professor Aderounmu is a visiting research fellow, University of Zululand, Republic of South Africa. He is currently serving as external examiner at various universities in Nigeria. As an active researcher, Professor Aderounmu has received several grants and scholarships. Within the last nine years, Professor Aderounmu has successfully trained 12 PhD and 35 MSc. candidates in Computer Science respectively. The widely travelled Professor has several Theses to his credits as well as over 90 published articles in journals and referred Conference Proceedings. As the President of Nigeria Computer Society, He currently serves as Special Assistant on IT to the Honourable Minister of Communications. Professor Aderounmu has received numerous awards for the development of Information Technology and Computer Science Education in Nigeria. Professor Aderounmu loves reading and travelling. He is married, a union blessed with kids.

Prof. Ali Selamat
Universiti Teknologi Malaysia

Ali Selamat is a Professor at Faculty of Computing, University Teknologi Malaysia. Currently, he is a Chief Information Officer (CIO) Director of Information and Communication Technology Center, Universiti Teknologi Malaysia (UTM). He is nominated as a Chair of IEEE Computer Society Malaysia Chapter, 2016 and appointed as a fellow at UTM-IRDA Centre of Excellence in Media and Games technology UTM. He was a Research Dean for a Research Alliance in Knowledge Economy (K-Economy RA) which is currently renamed as Smart Digital Community Research Alliance UTM. He was the Vice Chair of IEEE Computer Society Malaysia, 2014 and 2015, respectively. He was an auditor of IEEE Malaysia Section and a bursary of IEEE Computer Society Malaysia in 2013. Previously he was an IT Manager at School of Graduate Studies (SPS), UTM. He was a head of Software Engineering Research Group (SERG), K-Economy Research Alliance, UTM, a head of Software Engineering Department and the head of Postgraduate Studies Department, at Faculty of Computer Science & IS UTM from 2005 - 2012. Currently, he is the editor of International Journal of Intelligent Information Database Systems (IJIIDS), Inderscience publisher, International Journal of Digital Content Technology and its Applications (JDCTA) and International Journal of Advancements in Computing Technology (IJACT), which are SCOPUS-indexed journals. His research interests include software engineering, software process improvement, software agents, web engineering, information retrievals, pattern recognition, genetic algorithms, neural networks and soft computing, computational collective intelligence, strategic management, key performance indicator and knowledge management.

Prof. Boulou Ebanda de B'beri, *PhD*
University of Ottawa, Canada

Boulou Ebanda de B'béri is the Founding-Director of the *Audiovisual Media Lab for the study of Cultures and Societies* (www.lamacs.uottawa.ca) and a Full Professor in the Department of Communication at the University of Ottawa. Some of his recent publications include: *Global Perspectives on the Politics of Multiculturalism in the 21st Century* (with F. Mansouri), Routledge, 2014; *The Promised Land Project: History and Historiography of the Black Experiences in Chatham-Kent and Beyond* (with N. Reid-Maroney& H. K. Wright), University of Toronto Press, 2014; *Le Verbe au Cinema,* AfricAvenir/LAMAC&S, 2013; *The Afropessimism Phenomenon* (with & E. Louw, CRITICAL ARTS. Vol. 25(3) Routledge/UNISA, 2011; and *Les "Cultural Studies" dans les mondes francophones*. University of Ottawa Press, 2010. Prof. Boulou Ebanda de B'béri was the Principal Investigator of the Promised Land Project, a million-dollar research, funded by the Social Science and Humanity Research Council of Canada, focusing on studying the impact of black pioneers in Canada's nation building. He is currently working on another project focusing on the roles and trajectories of the 19th century "Black Press" in Canada and beyond.

Mr. Remi Afon, *CISSP, IISP, CISM*
President, Cyber Security Expert Association of Nigeria (CSEAN)

Solution-oriented Cyber Security Specialist with notable success executing broad range of corporate IT initiatives while participating in planning and implementation of information security solutions in direct support of business and government objectives. Energetic, visionary strategist qualified by BSc Computer Science (University of Ilorin), MBA and MSc Information Security from Royal Holloway University of London with over 16 years IT experience and 8 years record of ground-up success in cyber security. Remi Afon is a Certified Information Systems Security Professional (CISSP), Certified Information Security Manager (CISM) and a member of Institute of Information Security Professionals (IISP) UK, Nigeria Computer Society, Computer Professional Registration Council of Nigeria, Information Security Group (UK), ISC2 London Chapter and ISACA Scotland Chapter. Presently focused on implementing security improvement programmes for public and private organisations after years of working in core security operations. Remi is a member, Board of Trustees of Cyber Security Experts Association of Nigeria and Executive Director of Lynsec – a UK based Cyber Security Company.

PROFILES OF GUEST SPEAKERS

Dr. Isa Ali Ibrahim Pantami
DG/CEO, NITDA

Dr Isa Ali Ibrahim Pantami is the Director-General/CEO, National Information Technology Development Agency (NITDA). Until his appointment, he served as a Associate Professor of Computer Information System, at the Islamic University of Madinah, Kingdom of Saudi Arabia, the first Nigerian Citizen ever to teach in the institution of more than 63 years of existence. Dr Isa Ali Ibrahim Pantami was born and grew up in Gombe State, Nigeria where he obtained his basic knowledge, He completed his 1st Degree in Computer Science in 2002 at Abubakar Tafawa Balewa University Bauchi, Msc Computer Science 2008, Master of Business Admin. (Technology) in 2010 from the same University, and he obtained his PhD in the United Kingdom. He lectured at ATBU Bauchi for more than a decade before joining Islamic University Madina as Assistant Professor in Computing Systems & Information Technology. He has authored many books on ICT, STEM, Technology, Politics & Community Reconciliation & Religion, including The Negative impact of ICT on human health, Volume 2, no 2 Jomatech, 2010; An analysis of e-learning in Nigerian and United Kingdom Universities, Volume 2, no 1, International Journal of Computer and Information Technology, India; Information and Communication Technology, A Tool for Fraud Prevention and Detection, Volume 1, no 2, Jomatech 2008; Data Recovery and Back up Disaster, Volume 2, no 1, Jomatech, 2008; Analysis on the failure of Desktop and Laptop Hardware Components; Volume 2, no 1, Jomatech, 2008; and many more. Dr Isa has successfully participated in several seminars, international & local conferences and workshops as resource person, speaker, presenter, and discussant. He participated in NMFUK Conference which held in Newcastle 2011, Leicester, 2013, IT Conference in Paris 2013, Oil and Gas Computing, 2013, National Seminar on Graphing Calculators, University of Mathematics Malaysia, 2008, International Workshop on Family Planning and Reproductive Health

Mr. Abdul-Hakeem B. D. Ajijola
Executive Chairman, Consultancy Support Services (CS2) Limited

Founding & Steering Committee member, Organisation of Islamic Cooperation – Computer Emergency Response Team (OIC-CERT), Kuala Lumpur, Malaysia; Mentor, African forum of Computer Incident Response Teams (AfricaCERT), Accra, Ghana; Member, Cybersecurity & Cybercrime Advisors Network (CYAN) Paris, France; Resource person, South East Asia Regional Centre for Counter-Terrorism (SEARCCT), Kuala Lumpur, Malaysia; Resource person, International Telecommunications Union (ITU) Arab Regional Cybersecurity Centre (ARCC), Muscat, Oman; Resource person, on Cyber Security in Countering Terrorism & Violent Extremism Organization of the OIC Headquarters, Jeddah, Saudi Arabia; Past member, Council of Regional Advisors, West Africa, of the International Development Research Centre (IDRC); & Lead Consultant UNESCO: "Feasibility Study on the development of a Virtual Library by Institutions of Higher Education." Former Senior Special Assistant Innovation & Technology to the National Security Adviser to the President of Nigeria; Consultant to the Honourable Minister of Communications on Nigeria ICT Roadmap 2016-2019 & Nigeria Information Communications Technology Sector Strategic Plan 2016-2020; Instigator: Office of the National Security Adviser Nigeria Computer Emergency Response Team (NGCERT); Designed & implemented, National Information Technology Development Agency Nigerian Computer Emergency Readiness & Response ecosystem (CERRT.ng); Adviser, Cyber Security Experts Association of Nigeria (CSEAN); Member, Policy Drafting Committee 2001 National IT Policy; Member, Nigerian National ICT4D Strategic Action Plan Committee, Chairman National Security & Law Enforcement sub-committees & e-Government sub-committee; Lead Consultant for the development of: e-Parliament Framework, National Standards & Guidelines for e-Library & National Framework on Building Women & Youths Knowledge-Based Nation through IT; Member, Nigerian Cyber-crime Working Group (NCWG); Board Member, Backbone Connectivity Network (BCN) Nigeria Limited; &Executive Producer & Moderator, "Interfaith Forum" broadcast on television & radio. He has participated in several presidential, international & technical initiatives as well as attended several development programmes including an Executive Program on Science, Technology & Innovation Policy, Harvard University & certifications from the MIS Training Institute, Massachusetts, USA in Large Scale Computer Forensics, Incident Response; International Security in the Interconnected World &The Forum on Information Warfare; Certifications: Digital Forensics with Forensics Recovery Evidence Device (FRED) Digital Intelligence, Inc., USA; Universal Forensic Extraction Device (UFED) Cellebrite & Cyber Security Capability & Capacity Building Cyber Security Malaysia.

CONFERENCE PROGRAMME

Monday, November 28, 2016 Day 1		
Time	**Activities**	**Venue**
09.00 – 10.00	Registration	SICT Lecture Hall
10.00 – 10.05	Opening Prayer	
10.05 – 10.10	Opening Remark: Dr. I. Idris (Chairman, LOC, ICTA 2016)	
10.10 – 10.20	Goodwill Messages	
10.20 – 10.30	Welcome Address: Prof. M. A. Akanji (VC, FUT, Minna)	
10.30 – 11.00	Keynote Speech 1: Prof. Adesola Aderounmu (President, NCS) Title: *ICT For Development in 3rd World Countries – Nigeria as a Case Study*	
11.00 – 11.30	Group Photograph & Tea Break	SICT Lecture Hall Gallery
11.30 – 12.00	Guest Speech 1: Dr. Isa Ali Ibrahim Pantami (DG, NITDA) Title: *NITDA's Road-map for ICT Development in Nigeria*	SICT Lecture Hall
12.00 – 12.30	Guest Speech 2: Mr. Abdul-Hakeem B. D. Ajijola (Exec. Chairman, CS2 Ltd.) Title: *Information Technology based SME startups (Prospects and Challenges)*	
12-30 – 13.00	Keynote Speech 2: Prof. Ali Selamat (UTM, Malaysia) Title: *ICT for Development in the Third World Countries – The Malaysian Story*	
13.00 – 14.00	Lunch Break	SICT Lecture Hall Gallery
14.00 – 15.00	Parallel Workshop: ▪ Prof. Abiodun M. Aibinu Title: *3D Printing: Expanding the Frontier of Scientific Research* ▪ Mr. Victor L. Yisa Title: *Penetrating Your Windows 7: A Hacker's Delight*	SICT Labs III & IV

Tuesday, November 29, 2016 Day 2		
Time	**Activities**	**Venue**
09.00 – 10.00	Registration	SICT Lecture Hall
10.00 – 10.30	Keynote Speech 3: Remi Afon (President, CSEAN) Title: *The Role of Information Security for Effective ICT Sustainability*	
10.30 – 11.00	Tea Break	SICT Lecture Hall Gallery
11.00 – 13.00	Parallel Session 1: Tracks: ▪ Computer Science ▪ Cyber Security Science ▪ Information, Library, and Media Technology ▪ Telecommunication, Computer and Electrical Engineering	SICT Labs I – IV
13.00 – 14.00	Lunch Break	SICT Lecture Hall Gallery
14.00 – 16.00	Parallel Session 2: Tracks: ▪ Computer Science ▪ Cyber Security Science ▪ Telecommunication, Computer and Electrical Engineering	SICT Labs I, II, IV

Wednesday, November 30, 2016 Day 3		
Time	**Activities**	**Venue**
09.00 – 09.30	Keynote Speech 4: Prof. Boulou Ebanda De B'beri Title: *Mapping 19th Century Black Canadians Historiography with a 21st Century Geo-Mapping Technology: The Case of the Promised Land Project*	SICT Lecture Hall
09.30 – 10.30	Closing Ceremony: ▪ Presentation of Certificates/Awards ▪ Vote of Thanks: Prof. E. Onwuka (Dean, SICT, FUT, Minna)	
10.30 – 11.30	Cocktail Party	SICT Lecture Hall Gallery

KEYNOTE SPEECHES

Monday, November 28, 2016
Keynote Speech 1
10.30 – 11.00 @ SICT Lecture Hall

Prof. Adesola Aderounmu (President, NCS)
ICT For Development in 3rd World Countries – Nigeria as a Case Study

It is a known fact that one of the major actuators of any knowledge-based economy is information and communication technology (ICT). Consequently, its role in the growth and sustainable development of developing countries, Nigeria inclusive, cannot be overemphasized. This paper identifies the challenges facing Information Technology Industry in Nigeria, and discusses some strategies required to achieve the full potential of ICT as a driving force of the country's economy. Limited and high cost of internet access, especially broadband; lack of cooperation among operators; dearth of capacity in the software sector; and struggling hardware industry, to mention but few, are some of the problems currently plaguing the growth of ICT in the country. Consequently, to move the nation forward, there is need to, amongst others, encourage public-private partnerships at the different levels of government towards spreading fibre rings throughout the country, incentivize operators to increase investment in relevant infrastructure, promote the collaborative development of open source software, encourage indigenous software developers through different incentives, encourage patronage of locally developed hardware and software, establish IT parks, and establish assembly plants for production of hardware resources.

Monday, November 28, 2016
Keynote Speech 2
12.30 – 13.00 @ SICT Lecture Hall

Prof. Ali Selamat (UTM, Malaysia)
ICT for Development in the Third World Countries – The Malaysian Story

Information and Communication Technology (ICT) has increasingly become an integral component of global and economic transformations. It now serve as a yardstick for evaluating the competitiveness and accelerated level of technological change(s)of World economies. The impact of ICT diffusion in developing economies cannot be over-emphasized; yet, not all developing economies have utilized or are utilizing ICTs to effectively engender economic growth. This could be one of the major reasons behind the backwardness of some developing countries. This presentation therefore x-rays ways in which ICTs have aided a country like Malaysia to promote developments across many sectors which has empowered them to be more productive, thereby prompting economic growth and stimulating firms within and outside the country to be more competitive. This presentation would also consider how Malaysia is fully utilizing ICTs to enhance healthcare delivery, environmental sustainability, security, manufacturing, research and development. We hope that this presentation would stimulate the minds of participants to acquire greater appreciation of the potentials ICTs holds for social and economic transformations as well as the benefits that can follow for developing nations that fully exploit these benefits. We also look forward to engaging in a broader dialogue with policymakers, thought leaders and stakeholders on how governments, industries and workers can effectively collaborate to unravel the full potentials of ICTs in developing countries.

Tuesday, November 29, 2016
Keynote Speech 3
10.00 – 10.30 @ SICT Lecture Hall

Remi Afon (President, CSEAN)
The Role of Information Security for Effective ICT Sustainability

The paper discusses the attributes of Information Security as an enabler for ICT Sustainability and provides audience with an understanding of the role and potential of Information Security in information and communication technologies. From ransomware to IoT vulnerabilities, the paper outlines at a high level, key ICT infrastructures which are becoming cyber criminals' targets and what needs to be done to mitigate cyber-attacks. The paper also looks at how Nigeria can be a supplier of "offshore information security professional services" considering the global information security professional crisis in order to come out of current economic recession. It has been estimated that there will be a global shortage of 1.5 million cyber security experts by 2020.

Wednesday, November 30, 2016
Keynote Speech 4
09.00 – 09.30 @ SICT Lecture Hall

Prof. Boulou Ebanda De B'beri
Title: Mapping 19th Century Black Canadians Historiography with a 21st Century Geo-Mapping Technology: The Case of the Promised Land Project

The Promised Land Project: History and Historiography of the Black-Canadian Experience in Chatham-Kent's Settlements and Beyond is the result of a 2006-2012 Strategic Research Program, funded by the Social Sciences and Humanity Council of Canada (CRSH).The project's mandate was to create a Community-University Research Alliance that would cut across disciplinary boundaries and build bridges among academics, community researchers, and students at all levels. The research eschewed 19thcentury African Canadian history from the often romanticized "Underground Railroad" narratives that portray Southern Ontario as a safe heaven, a welcoming destination of Blacks fleeing from slavery. *The Promised Land* findings reveal that the Chatham-Kent area was not only a crucial settlement site for early Black presence in Canada, as well, but also a site of resistance and self-determination. Using Cultural Studies framework, members of this research trace physical and intellectual trajectories of blackness, which have radiated from this little town of Southern Ontario to other parts of Canada, the United States, the Caribbean and Africa. The methodological question arising from this finding was then: How can we represent this multiple intellectual trajectories and physical migrations? In this presentation, I will not so much focus on the technological outcome of the Promised Land Project; rather, I would like to talk more about the ways in which social scientists and humanity researchers could greatly benefit from Geo Mapping technologies to study human phenomena, from history, to managing demography, to implementing appropriate and effective policies. Indeed, by using today Geo Mapping technology together with historical surveys, we were able to trace, not only key historical black Canadian figures, but also all of the places impacted by their intellectual activism.

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