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# Information and Communication Technology (ICTs) as a Tool for Innovation

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## Abstract

The impact of information and communication technologies in bringing about a profound transformation in all aspects of national life in the world over does not need to be over stressed anymore. Information and communication technologies heralds a fundamental change in the dissemination of information with regard to among other things, economic, business and education. Ultimately, this paper attempts to give an overview of current initiatives around ICTs, and university development through a review of available literature. The overview will be followed by a selection of case studies of Ajayi Crowther University, documenting initiatives where ICT plays a prominent role and suggestions for further research and projects to inspire discussion for future research programme. This is part of a process to develop research programme exploring ICT innovations in, and the consequences of their possible application to university development.

ICTs and university development are extensive fields, and it is not possible to address all aspects in this paper but only what has been found to be of greatest current importance. When applying ICT to university development, it has been found that the most important challenges that institutions are currently facing are the responsibilities that have been transferred to them through recent decentralization. In this paper this aspect will thus be deliberately focused upon along with the ICTs that are of most relevant to these institutions meeting their new responsibilities.

**Key word:** Electronic resource; Information; Communication technologies; Innovation

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## INTRODUCTION

The advent of information and communication technologies (ICTs) created particularly in the early 1990's excitement and hope as the international development community argued the case for the role such technologies would play in accelerated and improved development action. Today it is possible to start seeing and measuring the initial impact ICTs has had, and begin to evaluate where and how to best take advantage and use these ICT tools for development.

The use of ICTs in the university will continue to grow and recent advances are likely to also increase their range and application dramatically. Access to these tools thus becomes a matter of critical importance for any Nigerian university that seeks to become viable and effective in training its students, producing and disseminating knowledge and preparing the next generation of citizens with adequate skills and the capacity to ensure national growth and economic development.

In electronics resource management and local development, ICTs have been applied in a variety of ways and for a range of purposes, and continues to have an increased impact on activities. Whether they are intercom to facilitate communication among faculties, internet to access and diffuse information, or satellite images to support research tools, including managing online and offline journals, ICTs offer tremendous possibilities that are being implemented across the continent.

In Africa the use of ICT for development is vastly

growing. Today, there have been a large number of initiatives and research, across the development field. Institutions such as Ajayi Crowther University has played a critical role in addressing this knowledge gap and ensuring more knowledge of the ICTs applied to development made available, in pushing for further research and knowledge of the area.

Information and Communication Technologies for Development is a general term referring to the application of Information and Communication Technologies (ICTs) in the field of university development. ICTs directly concerns overcoming the barriers of the digital divide. ICTs can be applied either in the direct sense, where their use directly benefits the disadvantaged student in some manner, or in an indirect sense, where the ICTs assist and aid institutions, non-governmental organizations and governments. In many impoverished regions of the world, legislative and political measures are required to facilitate or enable application of ICTs, especially with respect to communication structures and information bills.

ICTs initiatives and projects may be designed and implemented by international institutions, private companies, governments, non-governmental organizations, or virtual organizations (CGIAR Inter-Center Working Group on INRM, 2000).

ICTs projects address one or more of the following issues:

1) Infrastructure: providing suitable computer hardware, operating system, software and connectivity to the Internet. These would include the affordability of software and hardware, the ability to share software and the ability to sustainably connect to the internet.
2) Capacity building and training in ICT: installing, maintaining, and developing hardware and software, ergonomics, digital literacy (technological and informational) and e-awareness.
3) Digital content and services e-services (e-learning, e-health, e-business, e-commerce) including concerns related to local-language solutions in computing, and the Open Access agenda.
4) Regulation of the ICT Sector and digital rights: Universal Access as well as monopolistic structures, Intellectual Property Rights, privacy, security, and digital identity.

ICT refers to a spectrum of technologies and means that are related to computing, online and virtual technologies and processes; the combination of hardware and software and the means of production that enable the exchange, processing and management of information and knowledge.

They include for instance technologies that link producers to the market (e.g. mobile phone), assist local communities to map their territory and plan for their natural resources management, allow online education and health services (internet), help coordinate social movements and campaigns etc., traditional technologies like community radio broadcasting, and newspapers that are now having a greater reach and impact due to digitalisation.

The advancement of ICT and the tools it brings to development are an invaluable and essential to addressing these challenges.

When attempting to establish the challenges to natural resource management, not only the threats to natural resources caused by either human consumption or climate change needs to be examined, but also the structures on all governance levels, i.e. where the 'management' are happening (Fourth assessment report of the Intergovernmental Panel on Climate Change, 2007).

In Africa in general the most recent major change to natural resources governance is the new responsibilities (management of land and forests etc.) transferred to local communities, which have resulted from the decentralization process. Instability in government is obliged to develop new approaches and adopt new decision-making systems in order to meet their new responsibilities as to manage development. Two main concerns arise from this:

1) The commitment and inclusion of all stakeholders in the resource management and development planning process to ensure that the concerns of all including the socially disadvantaged are taken into account,
2) The harmonization of local interventions that are implemented by several types of institutional bodies intended to be complementary, but are generally competitors (government services, development projects, local communities, NGOs, social organizations, etc.). It becomes essential to promote overall coherence of activities undertaken in the field, by fostering dialogue to guide these interventions (systems of financing modalities to support local ownership use of proximity operators, etc.).

Local Area Development Plans and the way they are being developed and implemented are thus of utmost importance for sustainable development of communities and regions and for the management of natural resources. These will of course also need to be guided by effective management systems on national, regional and international level. However for the purpose of this paper, the main concern will be around the local aspects.

The effective management of natural resources in such challenging circumstances is of utmost importance and requires new more efficient approaches and technical innovations to be successful, and ICT is a critical part of this response.

Of course ICTs are also further assisting some of the natural resource 'mis-management' however for the purpose of this paper the focus will be on initiatives that feather the management of natural resources and attempt to benefit local communities and their development.

During the last two decades the development of

information and communications technologies (ICTs) and their application to local development have increased rapidly all over the world.

ICT is creating new market opportunities, enabling new sources of finance and improving opportunities for trade across the world, at all levels and now plays an increasing role in local development.

## ICTS INITIATIVES AND INNOVATIONS

A multitude of initiatives and innovations utilising ICTs for natural resource management and development have been implemented over the last decade. Mapping for land management, Geographic information system (GIS) for surveying resources, Participatory geographic information system (GPS) for tracking wild life are just a few of these. The application of ICT is not only used for top down initiatives, but also to ensure that local communities are able to be directly involved in decision and planning processes.

The intention here is not to show all the applications of ICTs to development and natural resource management, as clarified above, but examples from the literature where local communities are being aided by ICTs to manage the responsibilities transferred to them by recent decentralisation. The examples are grouped around five main areas; Community-based resource management (GIS, PGIS); accessing market and generating income (Mobile phones); monitoring carbon stocks (mobile GIS); tracking wildlife (PDA) and; multipurpose development projects (http://www.manobi.sn/sites/sn/).

The applications of the ICTs have been extended to include health and e-governance:

1) E-government applications – Online land registration and management by local authorities and GIS mapping linked to GPS.
2) Health applications – Electronic birth registration by midwives (UNICEF are major partners in this venture). Photos of the newborns are taken on mobiles, and additional data such as name, weight, and date of birth is transmitted to government authorities. This has now been linked to the online land registration process to improve efficiency and encourage uptake. Trains and equips midwife from each village participating in the programme to serve as 'project champion'.

These initiatives and businesses are happening across the continent, taking advantage of the widespread use of mobiles with great success and having a measurable impact on the incomes of the local population.

As seen in the above examples, a combination of ICT tools are usually used in initiatives and innovations, which is also the case for multipurpose development innovation that aims to aid more facets of local development.

## CASE STUDIES

In Nigerian Institutions especially Ajayi Crowther University, technologies in the innovation and facilities created include: computer literacy training rooms (33 Multi-user 441 Desktop Solution personal computers), a business resources centre, a call centre, a multimedia studio, a PC refurbishing centre, and a satellite office has also been established. The entire Ajayi Crowther University area is networked through a series of Access Points (APs) installed at public amenities such as faculty, clinics, libraries and registry.

Ongoing training targeted at students, staff and security agencies, and local business chambers is provided by the university management and the ICTs. An important milestone has been the development of software and training materials in computation of results.

The project has been able to produce a number of graduates from the training programmes, many of them students and many are now employed locally or have been recruited by national companies. It is the first place in Nigeria to have a multilingual, municipal and community web site and it has developed an internet-based radio station and a web-design cultural audio-video centre helping to preserve the region's cultural heritage. It is also the first ICTs training and testing centre for open source software.

A multipurpose initiative, such as the above project example from Nigeria, goes to address more community needs, such as capacity building, infrastructure and awareness, as opposed to many of the single objective projects and initiatives. It enables full participation from the community and is better able to respond to community needs and requirements. Raising awareness, delivering training and allowing access to ICT tools, also feathers the possibility for the communities to develop locally suitable application of the tools, as opposed to when they are simply trained to use one kind of ICT application.

In development where goals, such as the millennium development goals, are increasingly important, the multipurpose initiatives approach is possibly more effective, however questions of how it can be made sustainable remains an issue. Addressing an issue such as ICT in natural resource management in isolation is not possible, and all social aspects needs to be taken into consideration to achieve sustainability, and this is of course also the case with the choice of approach.

The examples above show many interesting developments in the application of ICT to local development and all of their experiences go towards strengthening knowledge of possibilities in the area. Whether it goes further than the specific project area and whether the lessons learnt go on to influence policies on a regional and national level is therefore questionable.

Also the fact that the projects and initiatives are mainly initiated and funded by external parties, leads to questions of sustainability of the application of ICTs to NRM in local development. This has been a central challenge for many projects initiative, where similar conclusions were made after their first phase of research and piloting.

The responsibilities for NRM has been 'decentralized' but very often no further capacity building or strengthening of local infrastructure take place to enable the government to deliver on their new responsibilities. Ensuring that they have the knowledge of and access to the ICT tools that can aid the development process of local development planning should of course be a priority for central government, however the financial repercussions that this has with administrative challenges, halted these advancements.

## RESEARCHERS AND RESEARCH ORGANIZATIONS

The majority of Ajayi Crowther University staff are computer literate. All academic librarians and most non-academic staff have undergone Computer training Courses in the Computer Centre of the University. Every academic staff has a set of computer with internet facility and other software to help in the effective discharge of their duties. The e-library has access to scholarly online databases and presently subscribe to DOAJ, JSTOR, OARE and other free access databases. There are other offline resources like CDs, DVDs and eGranary.

**1. Online Databases**

- DOAJ
- JSTOR
- OARE
- Nigeria Virtual Library
- EBSCOHOST
- HIGHWIRE ARCHIVE
- AFRICAN JOURNALS ONLINE
- INASP PERI
- REPEC: RESEARCH PAPER IN ECONOMICS

**2. Offline Databases**

- eGranary
- CDs & DVDs

## ACCESS TO THE ONLINE DATABASES

**1. DOAJ**

This service covers free, full text, quality controlled scientific and scholarly journals.

**2. HIGHWIRE ARCHIVE**

High Wire Press is the largest archive of free full-text science with the online publication of 1,454,619 free full text articles and 3,702,126 total articles.

## AFRICAN JOURNALS ONLINE

African journals online (AJOL) is a service to provide access to African published research, and increase worldwide knowledge of indigenous scholarship.

**1. INASP PERI**

INASP negotiates access to as many required resources as possible with content owners and publishers.

**2. REPEC: Research Paper in Economics**

Research Papers in Economics to enhance the dissemination of research in economics.

## OFFLINE DATABASES

**1. eGranary**

It contains millions of records accessible with or without internet connectivity.

**2. CDs & DVDs**

There are scores of CDs and DVSs containing information that range from general reference collections to specially designed information materials and so on.

## SUGGESTION

Since, the ultimate objective of integrating ICT into universities in Nigeria is to transform the academic environment into a knowledge and information powerhouse, with the ability, capacity and necessary skills not only to educate students and to generate new knowledge but also to systematically access, absorb, adapt and use such information and knowledge for the advancement of national development.

ICT s could have a greater impact through:

1) Shortening the distance and reducing transaction costs between stakeholders aiding local decision makers requires the generation, and provision of relevant information about agricultural production.
2) Enabling relevant intermediate agencies (NGO, producers associations etc) not only to disseminate latest research and developments in food production, but also to assessing and brokering relevant information
3) Capacity building through distance learning
4) Database application for efficient registration

ICTs have a key part to play in achieving these goals and implementing the above actions, from the research, data collection and storage, establishment of knowledge and management systems, decision support systems and early warning systems through ICTs. The technology is available; however the access to the tools and the knowledge and capacity to implement them is still a challenge.

## CONCLUSION AND RECOMMENDATION

Specifically, relating to development and resources, it was here found that especially decision making processes, be made by the individual, organisations or authorities, using ICTs can substantially increase the involvement of stakeholders and improve sustainability of any development efforts. This is not only in relation to resource management, but also to decide on the technologies themselves as to ensure that the technologies are appropriate for the local conditions, and applicable to relevant challenges facing the citizen. This is in all aspects of the effort, not only around research, but also the related knowledge management, decision making process, monitoring and evaluation. It appears that the next evolution of internet will especially open access development and more result in the reductions in cost and portable technologies.

Government should provide the necessary support by devising appropriate strategies and standards to ensure proper use of ICT technologies in all institutions. They could also offer incentive such as soft loan to subsidies for ICT investment. Government should also create an enabling environment to encourage foreign investment in the academic sectors thereby increasing competitiveness between existing and new online databases which will lead to an increase in adoption and use of ICT.

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