**Impact of ICT Revolution on the African Academic Landscape**

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## 1. Introduction:

The title of this paper is the "Impact of ICT Revolution on the African Academic Landscape." Embedded in this title are the following important words:

**Impact.** In more technical terms, impact is the reportable and verifiable difference that an intervention makes in the lives of citizens. **Impact is** the difference that an intervention, such as the use of ICTs is making in people's lives.

**ICTs.** ICT is a shorthand for the computers, software, networks, satellite links and related systems that allow people to access, analyze, create, exchange and use data, information, and knowledge in ways that, until recently, were almost unimaginable. ICT is used almost interchangeably with the Internet. The Internet and its applications (the most well known being the world wide web) is a shorthand for the infrastructure that brings together people, in different places and time zones, with multimedia tools for data, information, and knowledge management in order to expand the range of human capabilities.

**African academic landscape.** The academic landscape includes the teaching and learning process, along with the educational programmes and courses and the pedagogy or methodology of teaching; the research process, including dissemination and publication; libraries and information services; and university administration and management.

Based on the meanings of the words embedded in the title, there are two multifaceted questions asked in this paper: Given the range of the possible uses of ICTs in the academic landscape, how does one determine the difference that is attributable to ICTS in teaching and learning and research and the underpinnings of information services and university management? How does one examine the relationship between the form of ICT, how it is used, in what context it is used, and any impact on the user?

To answer the first question, let us take a look at global trends on ICTs and universities. Secondly, let us review the range ICT utilization in Africa in general. We will then examine the changes brought about by the use of ICT in one case study, NetTel@Africa. To start answering the second question requires formulating a research framework that includes an ICT Impact Assessment Tool to predict impact and to

assess impact over time of the utilization of various forms of ICTs for different functions in the African academic landscape.

## 2. Global trends:

Universities are now expected to contribute to society by widening access to higher education, continuing professional development, applied research, contributing to local economic impact, and improving social inclusion. Reviews of experiences in the use of ICT for education (for example, UNESCO, 2003) indicate the following trends:

a) ICTs are becoming an integrative part of national education policies and plans. ICTs are reflected in university strategic plans and documents derived from that plan, such as information policy plan, information master plan and information project plans.

b) The convergence of technologies has become a driving force for educational reform, making it possible for teachers and learners (and related support professionals) to connect better to information, ideas and each other via effective combinations of pedagogy and old and new technologies.

c) ICTs for teaching and learning undergo at least three phases: a **substitution phase** where traditional teaching occurs with the use of new technologies; a **transition phase** where new teaching and learning practices begin to appear as established practices start to be questioned; and a **transformation phase** where the new technologies enable new practices.

d) Lecturers are able to break away from professional isolation. With ICTs, they can easily connect with lecturers from other countries and with sources of teaching materials.

e) With information more readily available learners are not dependent on lecturers and librarians for information. Learners are helping redefine the role of lecturers and librarians so learners can focus on analyzing information and sharpening their critical thinking skills.

f) ICTs are altering the functions of libraries and changing the role of librarians. With a wealth of learning resources on the Internet, some of which are freely available, librarians are becoming information managers or cybrarians. These cybrarians will be computer experts and information brokers (Nentwich, 2003) who will be involved in structuring and will be engaged in publishing as well as in teaching.

g) Researchers are no longer faced with a lack of information but a glut of information. Data sharing, peer review and developing a network of contacts

are no longer constrained by distance as access to email, web based file and data sharing and web logs become more ubiquitous.

h) There is an increasing prominence of for-profit institutions as makers of products and providers of services (Microsoft in partnership with Blackboard; Hewlett-Packard and Placeware) or end-to-end e-learning solutions (e-college). Another example is when large corporations offer courses for academic credit by partner academic institutions (Cable and Wireless Virtual Academy in partnership with Global Technology University and Stratchclyde University in the United Kingdom). In this example courses are offered online and credits are easily transferred across national borders. Another example is setting up franchise-like arrangements where an institution (A) approves an institution (B) in another country to provide one or more of A's programs to students in B's country.

i) Universities are entering into partnerships with the private sector, in order to stay current as well as to get help on maintaining operation and financial viability of ICT based education programmes.

j) The Internet, and associated ICTs, is making it possible for various forms of cross border education, including trade in education. The relevance of traditional quality assurance mechanisms is being questioned and new mechanisms for ensuring quality in transnational education are being proposed (LaRocque and Latham, 2003).

## 3. Trends in Africa

The Association of African Universities (AAU), along with the World Bank, acknowledges in Revitalizing Universities in Africa (1997)) a "declining quality of university education" as a result of dwindling resources while enrolments are growing. Yet, there are positive signs as most African institutions have started to implement plans to ensure sound institutional management, transparent and accountable governance, a thriving intellectual environment, a modicum of facilities for faculty members and students, and above all, effective leadership. Universities have started to develop institutional strategic plans with stakeholder involvement. Increasingly their strategic plans are being used to renegotiate relationships with government. Universities are starting to build capacity for teaching and research at an international standard in one or more academic areas crucial for their country's economic or social advancement, foster and reward research, develop management information systems, and devise management training courses for all university managers.

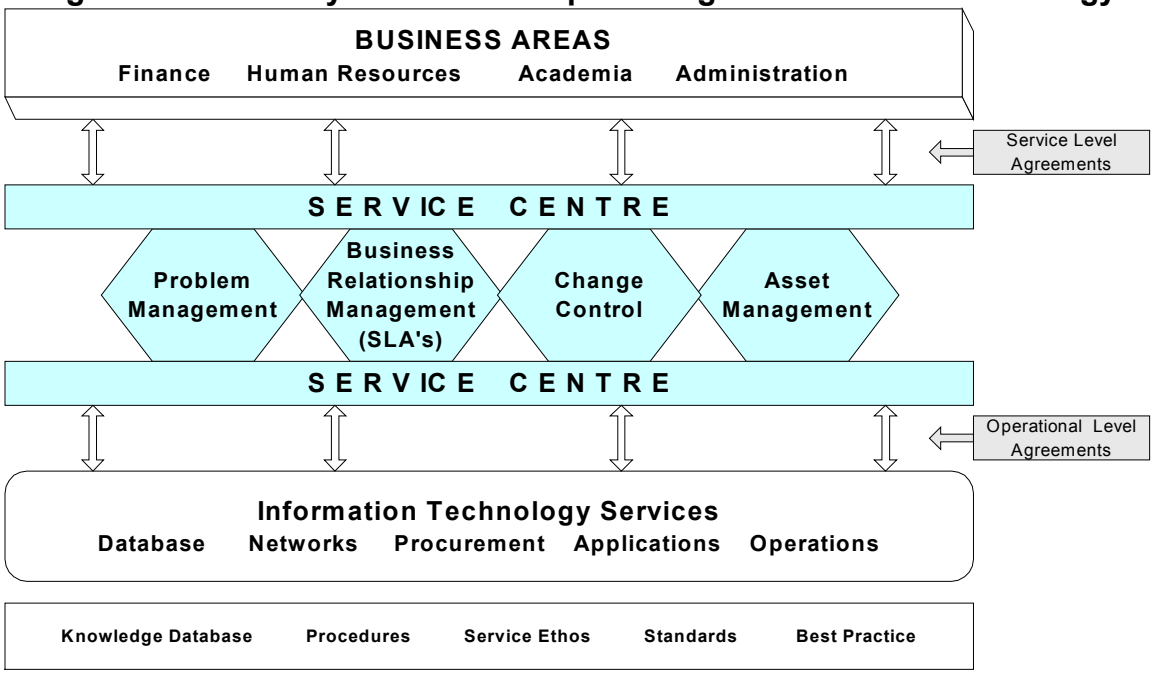
AfricaDotEdu: IT Opportunities and Higher Education in Africa (2003) highlights the challenges faced by African universities as they begin to realize the promise of ICT. Part one looks at the evolution of the Internet in Africa, the institutional policies that contribute to the development of the Internet, and the relationships among higher

education, economic growth and IT. Part two looks at regional initiatives, such as the African Virtual University, African digital libraries, community learning centres, distance learning, open content, institutional policies and eLearning. Another set of studies examines the use of IT that is not specific to the functions of higher education institutions but has implications for developing new curriculum in higher education institutions – for example, e-commerce and e-government. Another useful resource is ICT for Teaching, Learning and Research-A Workshop for African Universities: Securing the Linchpin (2002).

a) ICTs are being reflected in university strategic plans and institutional guidelines. More and more African universities are seeing the benefits of adding e to learning. Universities like Eduardo Mondlane University (Mozambique), Makerere University (Uganda), Obafemi Awolowo University (Nigeria), and University of Dar es Salaam (Tanzania) have ICT institutional guidelines that are aligned to their university strategic plans.

b) The use of ICTs for university management of financial, personnel and educational resources is exemplified by the University of Pretoria's Client Service Center. The Client Services Centre includes the following services: all general enquiries regarding University of Pretoria, residence, applications, payments, study financing, student accounts, student and personnel cards, parking discs, course consultation, and a computer laboratory for all registered students to access the Virtual Campus. Another example is the University of Western Cape's integrated information strategy as illustrated in Figure 1 below.

**Figure 1. University of Western Cape's Integrated Information Strategy**




Source: Keats and Darries (2003)

c) Increasingly library services are being digitized and viewed as a critical part of Africa's development. Mbambo (2003) defines a digital library as containing the following attributes: service to a specified community, digitally presented data, organized structure or organization, efficient information provision services, efficient control of resources, and collections which can include objects as well as texts. Furthermore, Mbambo (2003) envisions making African scholarship available through digital libraries.

d) The range of possible uses of ICT for teaching and learning is reflected by the blurring of distinctions between traditional distance learning institutions and campus-based institutions as both start to embrace some variation of eLearning. African universities are experimenting with blended learning or multi-modal learning. In addition to distance learning and open learning, other terms being used include Online Education, Distributed Learning, Internet Education, Computer-based Training, Computer-Mediated Communication, Computer-Assisted Instruction, Virtual Education, Cyber-Learning, and Asynchronous Learning. The meanings of these terms are starting to converge. Where there is a difference in usage is explained by place (same place, any place, on-campus, off-campus); time (same time -- synchronous or not at the same time -- asynchronous); interaction (learner to computer; learner to instructor; learner to other learners); use of the computer (presentation, interactive, collaborative, generative); type of technology (text, audio, video, multimedia); and absence or presence of face-to-face interaction. During the last ten years, distance learning, also known as open learning, has moved from a peripheral form of educational delivery to "one that is a central pillar in many countries' and institutions' educational plans" (ADEA, 2002). Rumajogee (2003) summarizes four generations of distance learning; the first being correspondence courses, with behaviorist views on teaching, lack of contact, and summative evaluation; the second is multi-media which still relies on print, integrates broadcast media (radio and television) and closed-circuit audiovisual materials (audio and video cassettes), some face-to-face tutorials, telephone counselling and to some degree, use of computer software; the third generation, relies on audio and video conferencing to ensure greater interactivity but deprives learners of the flexibility of time, place and pace. The fourth generation distance learning institution relies on the Internet and encourages the elaboration of multi-disciplinary knowledge.

Saint (1999) notes that:

1. Botswana, Cameroon, and Zambia are using a university-based Internet system to support interactive regional study centers for distance learners.
2. Tanzania, Botswana, and Zimbabwe have established new tertiary institutions wholly dedicated to distance education. The Zimbabwe Open University already enrolls nearly 10,000 students in nine programs and recently launched a master's degree in education for in-service teachers.
3. Côte d'Ivoire, Congo, Togo, and Benin are in various stages of setting up university-based distance education programs.

4. Nigeria's Centre for Distance Learning (Abuja) offers B.A. and B.S. degrees in 14 subject areas.
5. Madagascar has pioneered the use of audiocassettes for university programs in law and the social sciences.
6. In Senegal, distance education supports teacher training and Master's degree programs in health and law.
7. The Confederation of Open Learning Institutions in South Africa (COLISA), led by the University of South Africa (UNISA) is developing Internet-based courseware, a web-based student-teacher interaction system, and a series of local Internet access points for students.

e) New forms of collaborations are starting to emerge among higher education institutions in Africa. Despite less than perfect access to ICT, African higher education institutions are embracing learning networks to respond to the challenges posed by a rapidly changing and increasingly interdependent world. Despite the tremendous policy, infrastructure, and human resources constraints, learning networks in African higher education and training sectors are similar to those happening elsewhere.

Beebe (2003) notes the following forms of transnational collaboration that are starting to emerge in Africa:

1. Establishing remote campus branches away from the main institution to provide educational programs to students from other countries. For example, Monash University in Australia has campuses in South Africa and in Malaysia.
2. Twinning or partnership agreements between institutions in different countries to offer joint programs. This may involve reciprocal agreements or articulation of credits between institutions. For example, the Réseau Africain de Formation à Distance (RESAFAD) program delivers teacher-training courses from France in conjunction with universities in Benin, Burkina Faso, Guinea, Mali and Togo.
3. Cross-boundary consortia, such as the Consortium of African Schools of Information Systems (CASIS) composed of the University of Botswana, Ibadan, and Addis Ababa and the Formation à la Recherche et à la Spécialisation en Santé au Travail (FORST) program in occupational health that links Benin, Cote d'Ivoire and three other French speaking countries with McGill University in Canada and University of Lille in France.
4. Education business partnerships. Cisco, in partnership with African universities and donor programs, such as the United Nations Development Programme (UNDP) and the Leland Initiative of USAID, is establishing several Regional Networking Academies in Africa--Central African Republic, Chad, Côte d'Ivoire, Congo, Ghana, Kenya, Mali, Malawi, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Togo, and Uganda.

f) Undoubtedly email has made it easier for African researchers to share information, communicate, and exchange knowledge with each other and with

colleagues outside Africa. ICTs, including tools for collaboration, have made it easier to share datasets, publish weblogs (see Appendix 1 for an example), and get prompt feedback as well as peer reviews. This access to new research tools and communication systems will undeniably have an impact on the substance of research.

## 4. NetTel@Africa: a Case Study

Let us take at NetTel@Africa as a case in point. NetTel@Africa is a transnational network for capacity building and knowledge sharing in ICT and telecommunications policy, regulation and applications. The overall goal of NetTel@Africa is to make the provision of ICT and telecommunications services more efficient and ubiquitous to all African citizens. Achieving this goal requires improved policy and regulation as well as increased private sector investment. Nettel@Africa aims to build the capacities of policy makers, regulators, private sector operators, consumer advocates, and academic institutions. Starting with the Universities of Botswana, Dar es Salaam, Zambia and the universities of Fort Hare, South Africa, Western Cape and Witswatersrand in South Africa the network now includes Makerere University; Jos, Lagos, Nigeria at Nsuka, and Obafemi Awolowo in Nigeria; Eduardo Mondlane University; National University of Rwanda; Jomo Kenyatta University and Nairobi University; and discussions are underway with Addis Ababa University and University of Cheick Anta Diop.

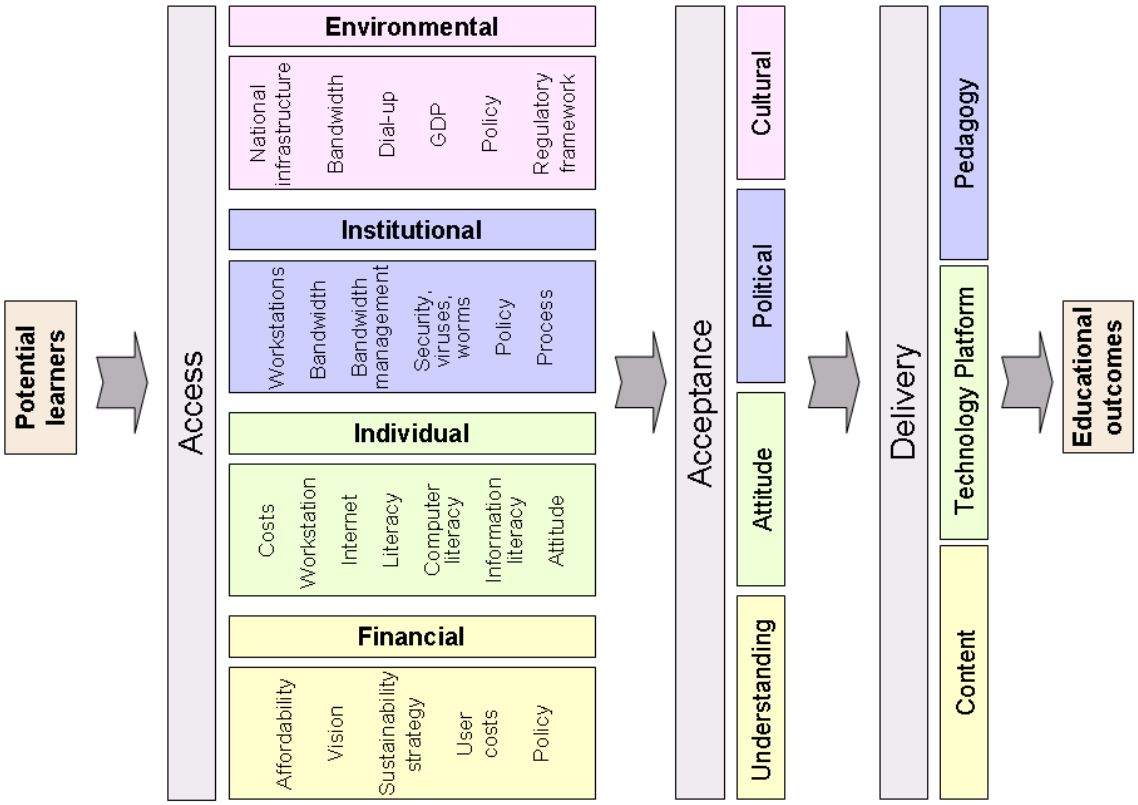
NetTel@Africa consists of four components: eLearning Programme in ICT Policy and Regulation; Peer-to-Peer Network (P2P); Community- to-Community Programme for ICT applications (C2C); and Research Programme. In this case study we focus on the e-learning programme, which follows a blended learning approach and is defined as the effective teaching and learning process created by combining digital content with local community and tutor support along with global community engagement.

NetTel@Africa faced access environmental, institutional, individual and financial barriers or challenges (Figure 1). The main delivery barriers are related to access to content, availability of a suitable technology platform, and knowledge of e-learning pedagogy. These have been addressed directly as part of the design of the NetTel@Africa project, and, in conjunction with addressing the institutional challenges.

**Content and quality assurance**. The network partners developed content for a new post-graduate diploma progamme in ICT/Telecommunications Policy and Regulation while at the same time developing the software for an online learning management system. With an African-led course development process and supportive role by U.S. academics, quality assurance included a supportive role by U.S. academics and ICT/telecommunications practitioners/experts from Africa and U.S. in identifying knowledge requirements, pilot testing of materials, peer review of materials, participation as online guest experts, and online mentoring. Developing content required locating and accessing large amounts of relevant information over the Internet, email interaction with colleagues in Africa and the U.S. and peer review of material that is posted on the Internet.

**Platform.** The technical platform for NetTel is the Knowledge Environment for Web-based Learning (KEWL), an open source (Gnu GPL Licensed) platform developed at the University of the Western Cape. Although itself open source, it is currently an ASP application running on Windows 2000 server, but is being redeveloped as a cross platform application in PHP. KEWL has most of the features common to commercial learning management systems and is ready for use to deliver online courses. All activity within KEWL is based around two main objects: user and course. When a user logs in to a KEWL site, permissions are established and appropriate links become available. The user is first in a "lobby" area, but once a user enters a course, then all activity takes place in relation to a course. If a user moves into another course, then all activity is related to that course, thus simplifying the actions that are needed to access different tools. KEWL features include course management, user management, content tools, assessment, communication, group collaboration, personalization, community tools, and administration (see Appendix 2).

**Figure 1: Conceptual framework to the digital divide as barriers to delivering educational outcomes to potential learners in higher education. These barriers overlap to some degree, and are not as discrete as illustrated here.**




Source: Keats and Beebe (2004)

**eLearning pedagogy**. In the NetTel definition of eLearning one of the embedded meanings is effective teaching that requires moving away from traditional settings to a restructured setting. Table 1 below (based on Brown, 1992) summarizes the differences between traditional and restructured education settings.

**Table 1. Differences between traditional and restructured education settings**

| | **Traditional Setting** | **Restructured Setting** |
|---|---|---|
| **Student role** | Store information | Create knowledge |
| **Teacher role** | Present information<br>Manage classroom | Guide student discovery<br>Model active learning |
| **Curriculum characteristics** | Breadth<br>Fact retention<br>Fragmented knowledge and disciplinary separation | Depth<br>Multidisciplinary themes<br>Knowledge integration and application |
| **Social characteristics** | Independent learning | Collaborative learning |
| **Role for technology** | Drill and practice<br>Direct instruction<br>Programming | Facilitate exploration and collaboration |
| **Assessment** | Fact retention | Knowledge application<br>Performance<br>Projects<br>Portfolio |

**Impact at the institutional level**. The first semester of courses was held during February-July 2004, with the second semester to be held August-December 2004. What is noteworthy are the changes that are occurring at the institutional level as these transformative changes represent one level of impact (see Table 2 below). Collaboration among the university partners rather than competition has become the priority. Partner universities have become co-developers of content rather than mere users of content developed elsewhere (old syllabus have been replaced, new material developed with links to digital resources). Delivery is across national borders and across time zones. Instead of hoarding knowledge, it is shared, and the paradigm shift from traditional to a restructured education setting is starting to manifest itself. A second level of impact analysis during the next six months is to verify that institutional changes that are happening are reflective of the following principles of good teaching and learning practice: encouraging contacts between students and faculty, developing reciprocity and cooperation among students, using active learning techniques, giving prompt feedback, emphasizing time on task, communicating high expectations, and respecting diverse talents and ways of learning. NetTel@Africa will continue to pay

close attention to quality on the line benchmarks, including institutional support, curriculum and instruction (course development, teaching/learning, course structure), student support, faculty support and evaluation and assessment benchmarks.

**Table 2. Institutional changes that had to happen within institutions to make NetTel@Africa possible; these changes may be transformative in scope.**

| Area | From | To |
|---|---|---|
| Business approach | Competitive | Cooperative |
| Content | User | Developer |
| Delivery | Within institution | Across borders |
| Educational processes | Discipline specific | Multidisciplinary |
| Focus | Internal processes | Collaborative processes |
| Flexibility | Restrictive | Flexible |
| IT System | Defined by producer, inflexible | Defined by user, adaptable |
| Knowledge attitudes | Hoarding | Sharing |
| Learning | Confined | Open |
| Pedagogy | Teacher-centred | Learner-centred |
| Perspective | Narrow | Broad |
| View of other institutions | Suspicion | Trust |
| Quality control | Internal | Shared |

Source: Keats and Beebe (2004)

The ultimate impact of interest is improved educational outcomes. Based on Kirkpatrick's four level model of evaluation (1994) we are monitoring: Level One--Reaction, Level Two—Learning, Level Three--Behavior, and Level Four--Results that are aligned to improvements in ICT/telecommunications policy, improvements in investments in the sector, and improvements in the performance in the sector. From the students who participated in the Semester 1 courses, reactions are generally favorable about the eLearning experience, the quality of the content, the delivery platform and the *perceived* value and transferability to the workplace. Both the lecturers and students are in agreement about the need to improve interaction with one another through setting clear standards for prompt feedback, emphasizing time on tasks, respecting deadlines, better use of the discussion forums, and emailing lecturers when learning materials or exercises are not clear. Overall the experience has been positive. One more contextual footnote is that the students are also full-time working adults from government ministries, regulatory agencies, non-governmental organizations and universities.

## 5. Research challenge: Determining Impact of ICTs on the African Academic Landscape

In the discussion above what is apparent is the need for a research framework that will: examine the relationship between technology use (the form of ICT, how it is used, in what context it is used), educational reforms, and any impact on the user (empowerment of teachers, changes in teaching and learning processes, and student learning) while considering the non-instructional uses of ICTs (university administration and management) and the digital library and information services within the broader environment in which education operates.

There are at least two tools that could serve as a foundation for formulating such a research framework: AAU's Assessment of ICT Maturity Tool (2000) and UNESCO/Bangkok's Manual for Pilot Testing the Use of Indicators to Assess Impact of ICT Use in Education (2003).

AAU's Assessment of Maturity Tool suggests the use of a matrix that looks at nine (9) sets of ICT variables and five (5) stages of ICT development.

The ICT variables are:

a) Strategic planning and performance monitoring tools: availability of university strategic plan, derived information policy plan, derived information master plan, and derived information project plans.
b) ICT infrastructure: type of infrastructure as well as accessibility and usage patterns.
c) ICT organizational (support) infrastructure: staff responsibilities in technical as well as functional areas.
d) ICT financing: funding for ICT internally and via fundraising; with distinction within budget votes or budget line items.
e) Application of ICT in teaching and learning: teaching objective for using ICT, professional development of academic (teaching) staff, technology access and usage patterns of academic staff, and technology access and usage patterns of students.
f) Application of ICT in research: research objective of academic staff and students for using ICT.
g) Application of ICT in academic information services (Library): extent of access to online public access catalogue, services in academic information management, and training in academic information management.
h) Application of ICT in administration and management: extent of ICT application for administration and management.
i) Training, Research and Development in ICT: training for ICT human resources development (workforce and leaders)

The suggested stages of technology development are:

a) Entry stage: HEIs teach students to use the technology.
b) Adoption stage: HEIs use technology to support traditional instruction.
c) Adaptation stage: HEIs use technology to enrich curriculum.
d) Appropriation stage: HEIs integrate technology and use it for its unique capabilities.
e) Invention stage: HEIs are prepared to develop entirely new learning environments that use technology as a flexible tool; learning becomes collaborative, interactive, and customized.

UNESCO's Manual for Pilot Testing the Use of Indicators to Assess Impact of ICT Use in Education suggests monitoring the following indicators: the types of ICTs and their accessibility, the extent and nature of professional development efforts, changes in teaching/learning practices, and improvement in what is learned by the students.

By putting together a research framework that will help universities assess the impact of ICTs in their teaching and learning and research, African universities can better report on the difference that ICT is making in student performance and can better exchange knowledge and share quality higher education across borders.

Finally, with emerging issues brought about by ICTS, such as trade in education and transborder education, there is also a need to do policy research.

## 6. Conclusion

> *We must be the change we wish to see in the world.*
>
> Mahatma Gandhi

The increasing speed and dissemination of ICT is already showing that our local universities and learning and research communities are no longer strictly local. They have gone global. Nevertheless, even in a global neighborhood, and as demonstrated by this workshop, we can still come together as a community and hold a conversation with a shared sense of participation and responsibility. As global educators and leaders, we must continually ask ourselves how best to: provide leadership in how people interact with technology; advocate for open content to make all the knowledge, skills and ideas in the world available to everyone; link learning communities from Africa with communities of practice from anywhere in the world; and advocate for improved access to use the Internet and associated technologies to acquire knowledge and act on that knowledge in a way that will make a difference in ordinary people's lives.

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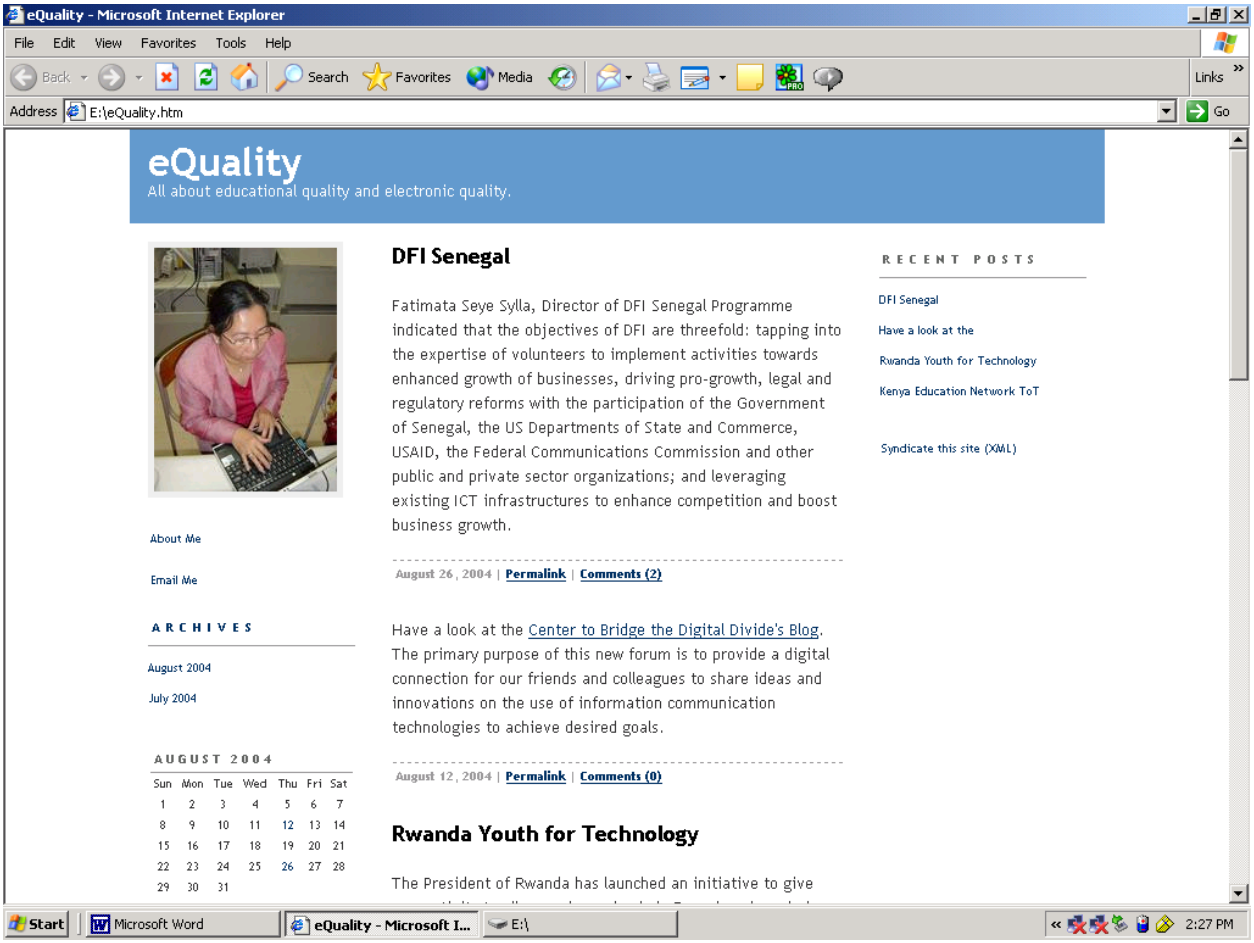
## Appendix 1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DFI Senegal
Fatimata Seye Sylla, Director of DFI Senegal Programme indicated that the objectives of DFI are threefold: tapping into the expertise of volunteers to implement activities towards enhanced growth of businesses, driving pro-growth, legal and regulatory reforms with the participation of the Government of Senegal, the US Departments of State and Commerce, USAID, the Federal Communications Commission and other public and private sector organizations; and leveraging existing ICT infrastructures to enhance competition and boost business growth.
August 26, 2004 | Permalink | Comments (2)
Have a look at the Center to Bridge the Digital Divide's Blog. The primary purpose of this new forum is to provide a digital connection for our friends and colleagues to share ideas and innovations on the use of information communication technologies to achieve desired goals.
August 12, 2004 | Permalink | Comments (0)
Rwanda Youth for Technology
The President of Rwanda has launched an initiative to give
RECENT POSTS
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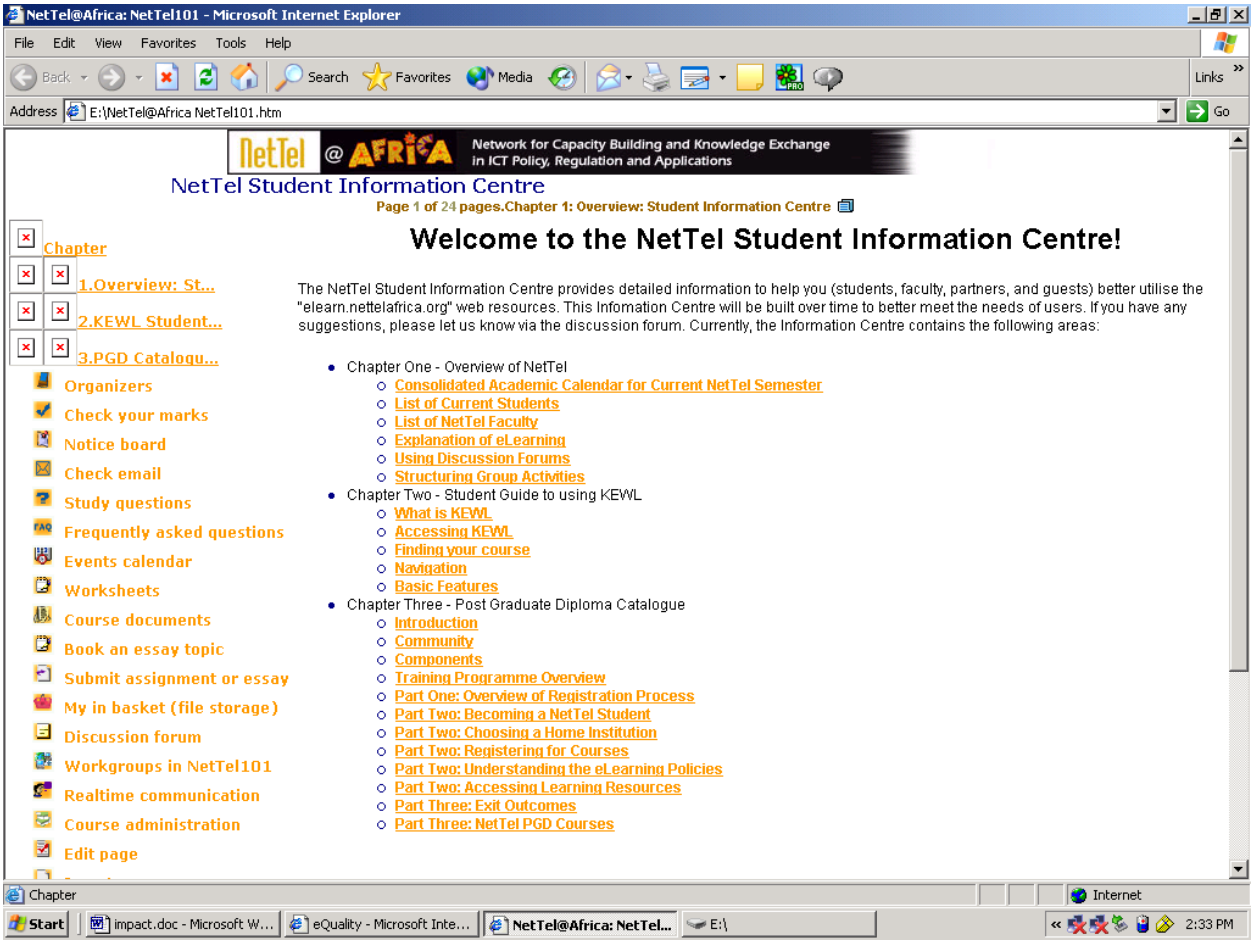
## Appendix 2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NetTel Student Information Centre
Page 1 of 24 pages.Chapter 1: Overview: Student Information Centre
Chapter
1.Overview: St...
2.KEWL Student...
3.PGD Catalogu...
Organizers
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Course documents
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Submit assignment or essay
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Discussion forum
Workgroups in NetTel101
Realtime communication
Course administration
Edit page
Welcome to the NetTel Student Information Centre!
The NetTel Student Information Centre provides detailed information to help you (students, faculty, partners, and guests) better utilise the "elearn.nettelafrica.org" web resources. This Information Centre will be built over time to better meet the needs of users. If you have any suggestions, please let us know via the discussion forum. Currently, the Information Centre contains the following areas:
Chapter One - Overview of NetTel
Consolidated Academic Calendar for Current NetTel Semester
List of Current Students
List of NetTel Faculty
Explanation of eLearning
Using Discussion Forums
Structuring Group Activities
Chapter Two - Student Guide to using KEWL
What is KEWL
Accessing KEWL
Finding your course
Navigation
Basic Features
Chapter Three - Post Graduate Diploma Catalogue
Introduction
Community
Components
Training Programme Overview
Part One: Overview of Registration Process
Part Two: Becoming a NetTel Student
Part Two: Choosing a Home Institution
Part Two: Registering for Courses
Part Two: Understanding the eLearning Policies
Part Two: Accessing Learning Resources
Part Three: Exit Outcomes
Part Three: NetTel PGD Courses
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