# TOWARDS A MODEL FOR E-LEARNING IN NIGERIAN HEIs: LESSONS FROM THE UNIVERSITY OF JOS ICT MATHS INITIATIVE

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## ABSTRACT

Nigerian Higher Education Institutions (HEIs) must prepare scholars to contribute to the global marketplace of ideas. Adopting an appropriate strategy for introducing Information and Communication Technology (ICT) for teaching and learning may be as critical as the content developed or shared. In efforts to rapidly introduce technologies for teaching, many universities may adopt models and content developed for, and in, other contexts. While global collaboration should be encouraged, it's critical that Nigerian HEIs work together toward building models to address specific challenges unique to the Nigerian situation. Towards a Model for e-Learning in Nigerian HEIs addresses key challenges in the Nigerian environment by detailing the experience the University of Jos faced in its six-year effort to implement an e-learning initiative in mathematics with support from the Carnegie Corporation of New York, Hewlett Packard, and the World Bank sponsored Science and Technology Education Post-Basic (STEPB) Project**.** The lessons learnt provide a model for other HEIs. Hence, the significance of this paper lies in its usefulness to Nigerian HEIs seeking to implement their own e-learning initiatives. In sum, this study provides a road map for successful implementation of e-learning initiatives in Nigeria.

## KEY WORDS

e-learning, mathematics, Nigeria, model, technology, and partnership

## 1.  Introduction

Advances in ICT  have revolutionised higher education in many ways; for example, increasing access to post-secondary instruction, improving the availability of educational resources, and facilitating meaningful interaction among learners.  Harnessing the power of ICT has become a critical strategy among institutions eager to offer an affordable, efficient, and flexible learning environment for rapidly growing and diverse communities of learners. Many scholars have viewed distance and online education as alternative, sometimes inferior, education for individuals with limited access to traditional higher education institutions (HEIs) or those not committed to deep learning [1].

Today, technology enhanced learning, including distance and online instruction, is recognised as a viable tool necessary for preparing citizens to participate in the technologically driven global environment. A multidisciplinary approach to online pedagogical research recognizes the value of technology enhanced teaching and learning as critical in the mix of diverse strategies. Its centrality in the global marketplace has been enhanced by a new culture shared by many educators. A culture diametrically opposed to elitist views of education as a privilege. A culture rooted in the belief that a more open education system enables increased contribution to the global marketplace of ideas.  This new culture empowers citizens of the world to share knowledge globally where diverse voices are often underrepresented. The culture has been exemplified by an open movement, with diverse champions from remote village classrooms to ivory towers.

Nigerian HEIs must prepare their scholars and graduates to contribute to the global marketplace of ideas. Adopting an appropriate strategy for introducing ICT for teaching and learning enables Nigerian HEIs to actualise their full potential.  In efforts to rapidly introduce technologies for teaching, many universities may adopt models and content developed for and in other contexts. While there is much to be learned from the experiences of others, it's critical that Nigerian HEIs work together toward building models to address specific challenges unique to the Nigerian situation.

This paper is significant because it outlines experiences unique to the Nigerian context. It details the opportunities and challenges the University of Jos faced in its six-year effort to implement an e-learning initiative in mathematics. The lessons learnt provide a model for other HEIs. Hence, the significance of this paper lies in its usefulness to Nigerian HEIs seeking to implement their own e-learning initiatives. In sum, this study provides a road map for successful implementation of e-learning initiatives in Nigeria.

Building a model for implementing e-learning initiatives at Nigerian HEIs is both timely and urgent. For the last

three decades, the National Universities Commission has worked to lay the foundation for e-learning through investment in ICT infrastructure, management information systems, e-mail access and library information services. Still, many institutions find it difficult to conceptualise and implement initiatives locally. There have been essentially three kinds of e-learning initiatives in Nigerian HEIs – local initiatives, corporate initiatives, and international partnerships. First, local initiatives are conceived and developed using local resources. Corporate initiatives – such as Cisco and Microsoft programmes – are developed abroad and delivered in Nigeria extensively through academies which are hosted in HEIs. The third kind has been developed through international cooperation. For example, the NetTel@Africa telecommunication management post graduate programme is sponsored by the Nigerian Communications Commission in partnership with regional stakeholders united in their desire to increase the capacity of the African ICT sector [2].

The University of Jos is unique, with experience of all three kinds of e-learning initiatives. While each type of initiative holds key benefits, this paper focuses on the importance of developing models to support and improve national initiatives. The challenges experienced in Nigeria are not unlike those experienced elsewhere. For example, the EDUCAUSE identifies five challenges in teaching and learning with technology: (1) Creating learning environments that promote active learning, critical thinking, collaborative learning, and knowledge creation; (2) Developing 21st century literacy (information, digital, and visual) among students and faculty; (3) Reaching and engaging today's learner; (4) Encouraging faculty adoption and innovation in teaching and learning with IT; and (5) Advancing innovation in teaching and learning with technology in an era of budget cuts. [3]

The above challenges mirror the ones facing Nigerian HEIs. In addition to creating a model for addressing these and related challenges, a central purpose of this presentation is to create a community of practice where Nigerian HEIs can share experiences and collaborate to address the challenges inhibiting the efforts to integrate technologies for teaching.

Employing the case study method, this paper draws lessons from the experiences of the University of Jos ICT Maths initiative. The study examines the literature on technology for teaching initiatives paying specific attention to efforts to prepare academics and create local content. The lessons learnt from the literature as well as the University of Jos experiences form the basis for a model for e-learning initiatives at Nigerian HEIs. This paper is organized in four sections. The literature review which follows makes the case for an emphasis on training as a key strategy for the diffusion of innovative teaching. This section is followed by a case study of the University of Jos ICT Maths initiative. The lessons learnt from the case study have been used to develop a model for

implementing e-learning initiatives at Nigerian HEIs. The paper ends with conclusions drawn from the literature and the University of Jos experience.

Nigeria ranks 62 among nations in terms of institutional e-readiness, the ability of a nation's institutions to use ICT to achieve their mission and vision.[4] The most populous country on the African continent, Nigeria ranks below South Africa and Egypt – which rank 39 and 57 respectively. Nigeria's e-readiness ranking highlights the need to seek innovative solutions to improve ICT usages.[4] "Innovation is complex and challenging within large organisations such as universities that are part of a mass system of higher education,". Efforts to introduce technologies in higher education must extend beyond technology transfer to consider what is known as effective innovation. Specifically, existing products need to be embedded into teaching and learning structures for students. ICT initiatives must address critical factors which include cultural change, time for academics to transition from traditional teaching to teaching with technology, as well as staff development and training needs. Fundamental change in the role of teachers in higher education institutions can result in culture shock. It is critical to assess the current environment from various perspectives in order to implement an integrated strategy to facilitate successful diffusion of innovation. [5]

The Umbrella Perspective for examining ICT recommends examining new technology for various levels of analysis: the social system in which the technologies are introduced; the organizational infrastructure in which the technology operates; the hardware and software available to users; and the individual users utilizing the software. Factors within each level of analysis may be identified as enabling, limiting, motivating, or inhibiting. Enabling factors are those that make an application possible. All four types of factors – enabling, limiting, motivating, and inhibiting – can be identified at the system, organizational, software, and individual user levels. However, hardware can only be enabling and limiting; by itself hardware does not provide any motivating factors. The motivating factors must always come from the human dimension, the messages transmitted (software) or one of the other levels of analysis. This perspective reinforces the importance of taking a socio-cultural approach when examining ICT. Successful technological initiatives are based largely on the motivated users who use technology in context to meet specific needs. For educational institutions which are focused on facilitating learning, a primary goal for technology usage is to facilitate teaching and learning. Training efforts designed to diffuse innovative teaching strategies should address enabling, limiting, motivating and inhibiting factors at all levels of analysis. For example, policy decision at the system level can ensure appropriate technologies are utilized effectively. The organization provides an enabling environment for technology usages by ensuring the effective implementation of ICT policies. Even with all systems

and organizational structures in place and working effective, sufficient emphasis must be placed on motivating individuals to actively use technologies. [6]

Students with the highest level of ICT skills acquire many of these skills as a result of course requirements. While students may develop information technologies skills from recreational use, their academic preparation provides the structure and competence necessary for them to compete effectively in the global marketplace. Six areas in which institutions should pay particular attention when implementing an ICT strategy in higher education are as follows: 1) integration of ICT into the curriculum; 2) definition of ICT skills; 3) training of students and academic staff; 4) common learning environments and consistent instructional approaches; 5) accessible and effective ICT service and support; and 6) monitoring and benchmarking. All six key areas are addressed in the University of Jos ICT Maths initiative. [7]

The South African Institute for Distance Education (SAIDE) ACEMaths project provides an excellent model for developing e-learning initiatives ACEMaths piloted a collaborative process for the selection, adaptation and use of Open Educational Resource (OER) materials for teacher education programmes in South Africa. The following are five principles which guided their efforts.

**1. Communities of Practice. Use a team approach to adapt the materials, with a team of teacher educators from different institutions.** If institutions work together and agree to share materials and approaches, not only will the time involved in adaptation be reduced, but the opportunity for learning from sharing of resources will be maximised. The goal in a project of this kind is not only to get a good product, but to engage teacher educators in discussions about what is good. The investment cannot only be in materials; it must be in the people actually teaching teachers day by day.

**2. Materials. Find existing 'good enough' materials and adapt these for immediate use.** Development of materials from scratch requires a lead time of 12 to 24 months, but very few materials development initiatives have the luxury of this timeframe. However, there are a number of institutions/organizations that have 'good enough' existing materials, and the time involved in adapting/customising them for the context and programme purpose will be less than that involved in developing them from scratch. In addition, the focus should be on use, rather than on preparation of an 'ideal' set of materials, as it is through use that the strengths and weaknesses of materials are discovered, rather than from de-contextualised reflection on instructional design, although judicious use of expert review is helpful.

**3. Course Design**. Aim for a single module that can be adapted and used in a variety of programmes, rather than on whole programme development. This is advisable for two reasons. One is that it is more cost-effective, but the second is that institutions are responsible for the development of their own programmes, and there is correctly resistance to a pre-packaged received curriculum, even if that curriculum is determined by and with respected peers. A single module on the other hand is perceived as a resource, rather than a blue print for delivery.

**4. Copyright.** Encourage institutions and authors to make their materials available under a Creative Commons BY SA licence, but do not make this a pre-condition for contribution. Intellectual property is a complex terrain, and the Open Educational Resources (OER) movement is challenging conventional notions in ways that many academics and institutions find threatening. There are some hardline OER proponents who argue for no compromise on the use of open source software and non-proprietary operating systems as well as particular licenses. However, the approach taken in this project is that the major goal is to increase openness and accessibility of educational resources, and any move towards greater openness should be supported. Hence, although our research indicates that the best licence for OERs is one of the Creative Commons BY-SA licenses (that require only attribution/acknowledgement of the author and sharing of the materials in the same way as they have been made available), this is not insisted upon.

**5. Technology.** Don't foreground technology or make it a sine qua non for participation – but stay in touch with new processes and tools that can enhance collaboration and increase efficiency. The concept of OERs is currently associated almost exclusively with electronic educational resources. However, the 'openness' or free accessibility of educational resources is not logically associated with their being available in electronic format, or developed using digital tools. The goal is not technological literacy, the goal is increased openness and the development, of an educational commons through collective effort. Sometimes so much energy is spent on understanding and using the technology that there is little energy and time left for developing high quality materials and courses. A collective effort may therefore not in the first instance be digitally facilitated, although to realise its full potential for access, digital formats and processes are necessary. [8]

Nigerian HEIs seek technological solutions to improve access to quality materials. Five factors which are critical in ensuring e-learning success include administrative leadership, continuous program monitoring, course development, professional development support for academic staff, and evaluation results. [9] As the literature demonstrates, there is a dire need for Nigerian institutions to improve e-readiness, facilitate innovative use of technology, and embed technology usage in higher education curriculum. In order to achieve the latter, academic staff need exposure to online pedagogic training. Pedagogy involves becoming aware of the different learning strategies and how, or to whom, and when to apply these strategies. [10] Sound pedagogy supported by strong theoretical foundations is of key

importance in online learning. [11] Since relevant literature on online pedagogy is largely situated in the field of education, it is not always well articulated in other faculties in the higher education sector. E-learning applications need to be informed by strong theoretical foundations that link theory with practice in order to ensure educational excellence. [12] Pedagogy, theoretical foundations, linking theory and practice, are all great challenges for teachers in the higher education sector.

The case study of the University of Jos ICT Maths initiative which follows outlines the university's efforts to use innovative e-learning strategies. Then Section IV uses lessons from the case study to develop a model for e-learning implementation at Nigerian HEIs.

UniJos ICT Maths Initiative
At the University of Jos, the Department of Mathematics runs heavily subscribed compulsory first year courses for students of all science-based faculties. The average enrolment in such courses is over 1500; too large to hold in one lecture hall while inadequate staff strength prevents splitting up into small enough groups for meaningful staff-student interaction. In addition to the shortage of teachers and lecture rooms, there are serious inadequacies with current books, office accommodation, and laboratory facilities. Figure 1 demonstrates inadequate staff strength at the University of Jos. As the figure shows, the problems are most significant in the Faculties of Medical and Natural Sciences.

**Figure 1. Comparison of prescribed and actual academic staff by faculty, University of Jos**
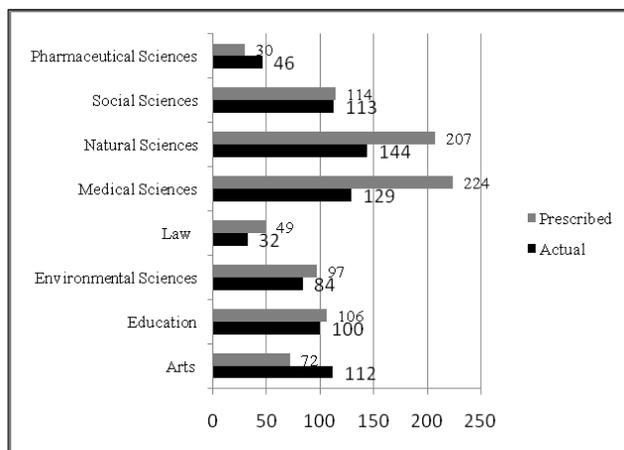


Source: Directorate of Academic Planning and Management, UniJos

To address these inadequacies, the Department of Mathematics received financial support from 2003 to present to initiate, sustain, and grow its e-learning efforts. The following outlines the initiative in three phases.

Phase 1 (2003-2006)
In 2003 the University of Jos received a US$2 million institutional strengthening grant from the Carnegie Corporation of New York. These funds provided the initial resources to implement the ICT Maths Initiative. The original goal of the team was to digitise lecture notes, providing students with standardised course material which could easily be updated. The project began with four pilot courses: Elementary Mathematics I and III, Elementary Statistics, and Introduction to Computer Science. Lecture notes for each course were developed by a team of four course content experts who lecture in the department. Each team compiled lecture notes, sample problems and model answers as well as solutions to past examination questions, complete with marking schemes for each of the three pilot courses under development. Materials for each course were peer-reviewed by professionals in the field. The materials were then edited and published on the University of Jos Intranet.

The Jos-Carnegie Partnership provided funds for hardware, software and training. More specifically, Jos-Carnegie funds were used to purchase 19 personal computers, three printers, and one diesel generating plant for back up power supply. Scientific Workplace Version 5.0 software was purchased and used to enable the digitisation of mathematics notations. Three young academic staff members trained abroad which in addition to developing their expertise in a given subject area provided them skills necessary to enhance their ability to teach with technology. Locally, academic staff received training on using Knowledge Environment for Web-based Learning (KEWL) as a course management system.

During this initial period, students primarily used KEWL to access lecture notes, print hard copies, and use the materials for self-study or in groups. The number of computers on campus could not adequately meet the needs of more than 1,500 students per class. Power shortages limited students' ability to participate in online activities. In addition, KEWL was under development by a consortium of African universities led by the University of the Western Cape with the University of Jos as a member of the consortium. One of the challenges resulting was that the community of educators using KEWL to teach mathematics was quite small.

The second phase of the ICT Maths Initiative focused on optimizing the use of the CMS and making the classes more interactive. This was facilitated by online pedagogic training, CMS facilitator workshops, participation in eLearning Africa conferences, and grant funding.

The ICT Maths team focused on pedagogic training to ensure that their online course development was guided by theoretically sound practices. Academic staff participated in a number of workshops designed to facilitate the transition from face-to-face to blended instruction. Specifically, lecturers received a series of technical workshops including beginning and intermediate training in the use of course management systems, Ubiquitous Presenter and Camtasia. Training also included one-on-one sessions with the project's designated technical support consultant who worked with

the team on uploading content, developing test banks, and other issues related to CMS functionalities.

During the initial phase of the ICT Maths initiative, content was uploaded on KEWL. Limited experience facilitating blended courses, lack of a community of practitioners teaching mathematics on KEWL, and instability of the university's network hindered the project's efforts to optimize KEWL as a CMS. Moodle, popular among educators around the world as a tool for creating online dynamic web sites for their students, was adopted by the University of Jos as a course management system in 2007. Motivated by functionalities supporting scientific notation and an international community of math educators already using Moodle, the ICT Math initiative started to upload courses on Moodle.

Moodle focuses on providing educators with the best tools to manage and promote learning, Moodle.org outlines the project's functionalities and use as follows: 1) Moodle has features that allow it to scale to very large deployments and hundreds of thousands of students, yet it can also be used for a primary school or an education hobbyist. 2) Many institutions use it as their platform to conduct fully online courses, while some use it simply to augment face-to-face courses (known as blended learning). 3) Many of our users love to use the many activity modules (such as Forums, Wikis, Databases and so on) to build richly collaborative communities of learning around their subject matter (in the social constructionist tradition), while others prefer to use Moodle as a way to deliver content to students (such as standard SCORM packages) and assess learning using assignments or quizzes. [13].

Phase 2 – (2006-2009)
Government cannot provide adequate funds to modernise teaching and learning strategies for Nigerian HEIs. In fact, government has consistently cut budgets for HEIs and encourages institutions to seek private partnerships. Private grants were critical to the project's success. In 2006-2008, ICT Maths received approximately US$43,000 from the Jos-Carnegie Project. In 2008 the project received a significant boost when it emerged the only university in Nigeria to share in Hewlett Packard's $3.6 million corporate social responsibility project aimed at empowering about 36 universities in Europe, Middle East and Africa with cash and equipment. Other beneficiaries in Africa included the Makerere University Uganda and University of the Free State, South Africa. The HP Technology for teaching Grant Initiative represents the company's commitment to innovative education and transformation of students' achievements through the use of technology in the classroom. HP has contributed in five years a total of nearly $60 million to more than 1,000 schools in 41 countries worldwide and had in the past 20 years, contributed more than $1 billion in cash and equipment to schools, universities, community organizations and other nonprofit organizations around the world.

The 2008 HP Technology for Teaching Grant to the ICT Maths team is valued at approximately US$100,000. The equipment includes 21 HP Compaq Notebook/Tablet PCs with Microsoft Vista operating system, 21 HP Ultra_slim Expansion Base with DVD drive, 3 HP iPAQs, one HP Designjet, one HP Designjet Printer Stand, one HP Procurve Wireless Access Point, one HP ProCurve Switch 408, one digital projector, and one Mobile Net Education Center.

$20,000 cash from the grant is also earmarked for the principal investigator to use to support the work of the project and facilitate attendance at the annual HP Technology for Teaching Worldwide Higher Education Conference in San Diego. Two members of the ICT Maths team attended the conference in 2008 and a one in 2009. In 2008 the team witnessed a presentation using Ubiquitous Presenter (UP) and envisioned the technology's potential for addressing their desire to make classes more interactive. UP allows lecturers and students to annotate presentations on tablet PCs during lectures. Tablet PCs and UP make learning more interactive and pleasurable. The team uses Camtasia to add voice narratives to power point presentations that are uploaded on screencast. Using links from the course main website on the CMS, lecturers can select from a variety of teaching and learning strategies to help students achieve the objectives of the course. The flexibility with time and place in the use of e-learning materials lends to positive exploitation of individual differences with learning. Multiple Choice Questions are used on learning platforms for easy and regular assessment of large groups of students. Conventional methods of assessment complement these objective tests. TRUE/FALSE IS AN MCQ!

The ICT Maths initiative's use of both KEWL and Moodle demonstrate a commitment to using open source course management systems (CMS) as a sustainability strategy. Specific tools available on both CMS include the ability to post lecture notes, audio and video presentations, assessment tests, forums, charts and e-mails. Another CMS feature is the ability to easily link to external sites. Students have one location, a virtual classroom where they can log on and access all class-related content. In addition to locally created content, lecturers can guide students to external content by creating links. For example, students can review detailed lecture notes or synopsis on Power Point. Both represent local content created by ICT Maths content experts. In addition, students may be directed to click on a line to open content created externally and explore resources. ICT Maths courses includes link to Carnegie Mellon and Massachusetts Institute of Technology (MIT) Open courseware.

Participation in regional and international conference played a significant role in developing the ICT Maths initiative. Team members participated in eLearning Africa 2007 and 2008 where they gained exposure. It was at a

workshop of the Nigeria ICT Forum that team members learned of the Hewlett Packard Technology for Teaching grant initiative. With support from the Forum, the team successfully competed for the HP technology for teaching grant. Participating in the HP conferences demonstrates the importance of communities of practices -- people who engage in a process of collective learning in a shared domain. The experiences from the conference have enriched ICT Maths which in turn works with other communities of like-minded scholars to share knowledge acquired.

Phase 3 – Future direction
Now that a relatively stable course management system is in place, the next step is to assess its effectiveness and make continuous quality improvements. The third phase of the initiative explores the use of technology to improve mathematics instruction and student performance enabling the university to more effectively prepare students in science-based disciplines. The project involves course redesign, materials acquisition and development, student-centred pedagogic training, integrating technologies, replication and impact assessment. The materials developed are open content, made widely available to other Nigerian institutions. The goal is to stimulate a national initiative for the badly needed paradigm shift from 20th century pedagogy (the sage on the stage with lectures) to 21st century, student centred pedagogy (a guide on the side with inventive thinking, effective communication and team work).

With additional funding from the World Bank and Federal Ministry of Education Science and Technology Education Post-Basic (STEPB) project, phase three addresses the problem of poor performance of students in first-year mathematics through development of local content and research into new ways of teaching and learning. Key objectives of phase three include:

▪ Building a community of practice among Nigeria HEI policy makers, administrators, and academics to encourage shared human and material resources;

▪ Exposing Nigerian HEIs to what's possible with educational technologies and explore areas of collaboration and partnerships;

▪ Supporting capacity building in the use of technology for teaching and learning through training;

▪ Redesigning existing courses based on course evaluations and peer reviews;

▪ Adhering to international property and copyright laws by securing the appropriate permission for materials acquisition and development;

▪ Exploring new ways of instruction and learning through participation in learning communities;

▪ Comparing the performance of students trained using the new methods with others trained in the traditional way;

▪ Increasing the use of technology for teaching and learning to a system-wide teaching and learning initiative as envisaged in the university ICT strategic plan.

Today, at Jos, a leading ICT University in Nigeria, we can boast of only 1500 systems for a population of 15000 students. Faculty based student-run computer laboratories and library computer facilities enhance the chances for students' engagement with these limited resources. A small but increasing number of students and staff own laptops. The mathematics department is acquiring 72 tablet PCs to improve student access. The following model is proposed as a strategy for implementing e-learning initiatives.

Model for e-learning initiatives in Nigerian HEIs
The proposed model for implementing e-learning initiatives in Nigerian HEIs draws significantly on the experiences of the ICT Maths initiative at the University of Jos. In addition, it is informed by the principles of the SAIDE ACEMaths project which piloted a collaborative process for the selection, adaptation and use of open educational resources for teacher education programmes in South Africa. Figure 2 presents a model for pre-project activities.

**Figure 2. A model for pre-project activities**
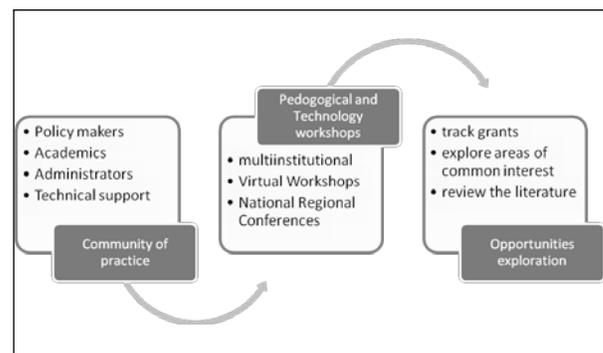


In order to prepare for e-learning initiatives, it is necessary to address systemic constraints. For example, e-learning initiatives benefit from policies and practices supporting their successful implementation. Building a community of practice which includes participations from policy makers, academics, administrators and technical support professionals ensure that policies put in place are having the desired effect. Successful communities of practices include Web 2.0 tools (discussion forum, blogs, websites). The most effective communities have feedback mechanisms and a culture that encourages contribution from various levels of the hierarchy. Critical components of a successful e-learning initiative in Nigeria include administrative leadership, continuous program monitoring, course development, professional development support for academic staff, and evaluation results.

First administrative leadership plays a critical role in enabling the cultural shift necessary to support e-learning. In addition to ensuring that the initiative has access to the necessary human and material resources, administrators must also examine how participation in e-learning will affect academic staff workload, tenure, and promotion. Second, e-learning initiatives require continuous monitoring, contingency plans, and flexibility. What appears feasible in theory may not always work in practice. The initiative feels strongly about supporting KEWL from a philosophical position; however, in practice Moodle better served the project needs. As a result, the team continued to support the development of KEWL and adopted Moodle as an alternate platform. Third, courses are not stagnant. They must continuously evolve as new knowledge becomes available and technology changes. It's important not to think of your e-learning initiative as "complete" rather, as continuously evolving. Fourth, as technology evolves so must we. Professional development should be continuous and dynamic. A community of practice where like-minded individuals share ideas on a regular basis should augment periodic workshops. Finally, formative and summative evaluations provide the tools needed to improve initiatives and provide an excellent opportunity for sharing results with wider communities.

Next, academic and technical staff benefit from sensitisation training before efforts to implement an actual project. Attending conferences, seminars or workshops which demonstrate what's possible in higher education with technology motivates participants to implement projects and eases the culture shock which accompanies mandatory transitions to technology for teaching. The final action interested parties may take before implementing a project is opportunities exploration. This includes tracking grant opportunities, deadline, and criteria; exploring areas of common interests by joining online discussion forums, networking at conferences, and association meetings. Perhaps one of the most useful exercises one may engage in to prepare for implementing an e-learning initiative is an exhaustive review of the literature. Learning from the successes and obstacles others have faced when implementing similar projects should not be underestimated. This is an area of concern. Nigerian HEIs have not adequately documented technology innovations implemented to support teaching and learning. Inter-institutional collaboration has been limited by inadequate telecommunication infrastructure. Today, academic staff have increased access to various communication technologies which make future collaboration possible. The following model summarises the three pre-project activities which enable successful e-learning initiative.

There must be investment in pedagogic training and a structured introduction of technology to create course content for web based delivery. For Training in pedagogy, instructional materials design and development, an area in which local expertise is minimal, the use of blended e-learning to train the teachers who will use blended e-learning to teach is an attractive option. JCPC e-learning fellowships can be considered an evolving model as we try to reduce dependence on external players while increasing the participation of local players to generate local content and build e communities.[14] The following model outlines steps for launching a pilot project.

**Figure 3: Model of implementation process for e-learning in Nigerian HEIs**
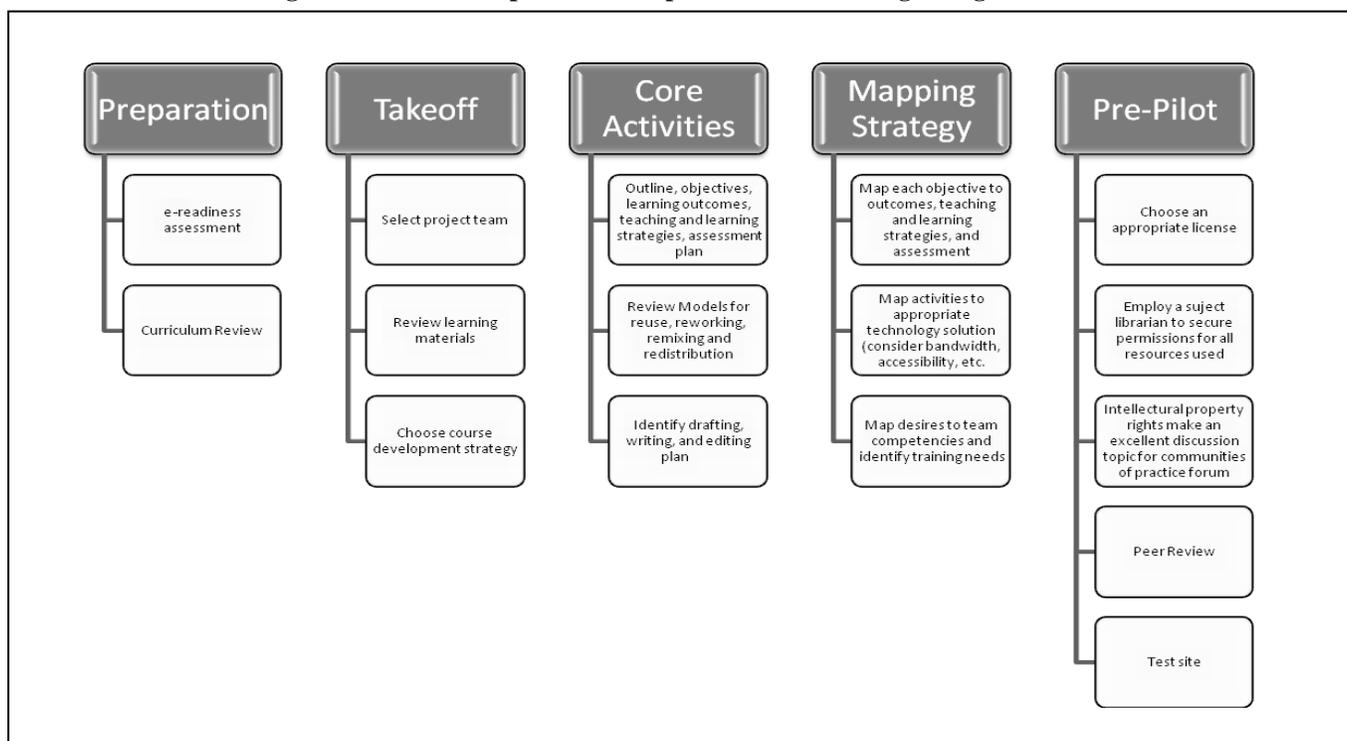
# 3.    Conclusion

In most Nigerian HEIs, ICT infrastructure is basic with a great need and demand for growth. Growth can be stimulated by the use of technology for research, teaching and learning. Researchers have no option but to use ICT resources to remain relevant and publish internationally. Teaching and learning however can remain local, not impacted by current international trends and standards, for much longer periods. The pressure to change in the Nigerian teaching and learning arena is significantly less. Once computers and a network are in place, e-learning activity can commence. At this stage, the use of CDs and other intranet resources such as the e-granary is critical. Once Internet access is in place, the creation of digital local content stimulates the rapid use of ICT especially if this local content drives users to complimentary web resources. We start, therefore, from the premise that HEIs are ready for e-learning as soon as computers and a network are in place, and pedagogical know how can be provided.

In the last 20 years Nigerian HEIs have experienced staggering increases in student population, while working with inadequate resources. They continue to use outdated course materials and old instructional perspectives that are damaging institutional prestige. The best and brightest are rejecting local institutions in preference for overseas training and opportunities. Nigerian HEIs are therefore losing the most valuable national resources. Entrepreneurs and professionals are taking the HEIs less seriously and they are deprived of potential supporters, partners and lecturers. A Lose - Lose situation.

It is now imperative to embrace change and make the paradigm shift into 21$^{st}$ century education. This is the only way for Nigerian HEIs to address the lacks, become relevant, survive, and grow. Resources are inadequate to meet existing educational deficits, using conventional approaches. The power of ICT to connect teachers and learners to the knowledge they need wherever that knowledge exists has to be harnessed. Incorporation of new technologies has to be radically accelerated. Departure from existing norms and practices, incorporation of new technologies for blended e-learning will prepare our institutions, for local content creation as well as for Open and Distance Learning (ODL).

In creating local digital content one can leap frog by going through the fundamental phases in minimal time, rather than eliminating them. Digitising notes, identifying the deficiencies and remedying them provide a natural lead to blended e-learning. Digitising notes in Nigerian HEIs has other positive benefits as sale of handouts and accessibility to teaching materials have been problematic -to the extent that a union has a national document on the issue. Complementing past examination questions with solutions and marking schemes is one of many steps to get students comprehensively briefed about the grading system and how their continuous assessment scripts are moderated. Self assessment facilitates individual work and assessment for learning, while exposing students to more web resources as is done with MIT open courseware; e-granary; and CMU OLI.

Objectives and outputs give teaching and learning more focus. The human networks to drive technological networks are being nurtured through team teaching. The champions, leading teams, are recruiting converts for a mass movement. On-line materials constrain staff to meet international benchmarks and improve on quality assurance. Open digital local content motivates collaboration. Creating local content for blended e-learning is a first step to redesigning or repackaging content for ODL which will absorb part time programs.

Learning habits can be significantly changed as staff and students use "help" and are not helped, web skills improve exponentially fast. Reading habits improve with regular prescribed reading lists.  Students become more independent through participation in systematic collaborative work.

Innovative strategies have to be adopted to remove the resistance of staff to change. Stimulants such as e-learning fellowships with attractive incentives can increase participation in digital local content creation. The comparatively poor status accorded to good teaching against the status accorded to research is a big threat to local content creation. Young staffs want to do research and get doctorates in their disciplines while older staffs are resistant to change if inertia has set in. Increased opportunities for younger staff to enter the realms of "technology for teaching and learning" through overseas training must be realised through an aggressive campaign and special programs.

Continuous training and retraining is critical. The use of discipline specific on- line course materials for training faculty on the LMS can bring real life problems to the fore. Sharing of resources and experiences can maximise the outputs in quality and quantity. Mentoring is an imperative.

Nigerian Institutions all want to start their own initiatives from scratch. There is a dire need to advertise the advantages of networking and collaboration; the need to leverage on the successes of leading institutions. The role of a national research and education network in this venture is critical. Skills development and training are better done through such a network. Consortia for bandwidth and computer peripherals can reap big gains for the Forum.

## 4. Acknowledgement

sustainable change. Carnegie Corporation of New York is the accepted pioneer for the use of technology in teaching at the University of Jos and STEPB support is appreciated.

## 5. Biography of Authors

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