

# Dynamics of adoption and usage of ICTs in African universities: a study of Kenya and Nigeria<sup>1</sup>

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## Abstract

We employ new empirical data from interviews of over 200 academics in 10 universities in Kenya and Nigeria to explore the dynamics of Internet adoption and usage in African universities. Our results suggest mixed demographic significance.

Among academics, age is positively correlated with use while we found no significant gender disparity in Internet use. Individual income and institutional provision of end-user facilities influence adoption and use. Internet use for research and teaching is still limited to the most basic functions.

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## 1. Introduction

The Internet has emerged arguably the most visible component of the information and communication technologies (ICTs). The rate of adoption of the Internet exceeds that of all technologies before it.<sup>2</sup> Its use ranges from communication, publishing to research. It has impacted, albeit, differentially every sector, from manufacturing, services to education. Higher education is particularly crucial to long run economic growth because it is the source of knowledge workers and an important source of inventive outputs. The role of universities as centres of research and diffusion of findings will become increasingly important in the 21st century (Rosenberg, 2001). Secondly, higher education produces skilled engineers and scientists whose skills and knowledge drive the industrialisation process. Again as competi-

tiveness becomes less price-based and more innovation-driven, the dual role of universities listed above will become decisive factors in transforming economies. The Internet is perhaps the most remarkable technological breakthrough of the 1990s. Undoubtedly it is, and will continue to play an important role in transforming higher education itself just as the universities have contributed in remarkable ways in generating new technologies in ICT, life sciences and biotechnology.<sup>3</sup>

In this study, the first of its kind that we were aware of, we carried out extensive surveys and conducted in-depth interviews of academic users and non-users of computers and the Internet in an attempt to understand the dynamics of adoption and use of a new technology in a developing African country. The paper is organised as follows: In Section 2, we review briefly the state of the communication infrastructure in Kenya and Nigeria followed by Section 3, with a framework for analysing adoption. Section 4 presents a methodology and in Section 5 we present the findings while Section 6 concludes the paper.

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<sup>1</sup> The Internet is taken as representative of information and communications technologies (ICTs), as it is made up of a cluster of innovations and national and end-user equipment and knowledge bases.

<sup>2</sup> It took 38 years for 50 million people to tune to the radio, the TV took 13 years; 16 years after the first personal computer (PC) kit came out, 50 million people were using it. The Internet took 4 years to achieve this target (OECD, 1998).

<sup>3</sup> American universities contributed directly in creating the Internet through research funded by the federal government. Four universities; MIT, Stanford, Carnegie Mellon & UCB, working for the Department of Defence was central to the research (see Rosenberg, 2001 for details).

## 2. The Internet in Nigeria and Kenya

Computing infrastructure consists of both hardware and software components and includes services such as programmes design, training and networks development. The Internet with its linked computer systems is an important component of the national connectivity infrastructure. There is no reliable data on the number of installed PCs in Nigeria, but there are indications that progress is being made with regard to Internet connectivity. Dial-up e-mail providers are still few compared to the overall population. The few existing operators are localised in big cities and operate on low bandwidth links.<sup>4</sup>

Nigeria's state-owned carrier, NITEL has to date established four points of presence (POPs) with a 2 MB link to Global One in the US. An Internet backbone (IIA Nigeria) is being established with support from the UNDP. NITEL's telecommunications school is being transformed into a regional Internet training centre. The National Communications Commission (NCC) has licensed over 40 Internet service providers (ISPs), with 15 currently active and providing Internet services. However, according to statistics Nigeria had over 38 ISPs, while Kenya had over 30 ISPs by 1999.<sup>5</sup> South Africa has five times this number and provides relatively more efficient and sophisticated services (Cogburn and Adeya, 2001). In Nigeria, a number of the ISPs now operate their own VSAT linked directly into the US backbone, bandwidth wireless links. However, computer penetration is low and Internet penetration lower still and remains a luxury item, restricted to certain institutions and groups as with most other African countries.

The 1999 average cost of using a local dial-up Internet account for 20 h/month is about US\$68 (including usage fee and local call time), while in Kenya it was double of that, at about US\$123. In the US, the average cost is US\$29 for 20 h/month including telephone charges. This comes to US\$1.45 h<sup>-1</sup> compared to US\$3.4 h<sup>-1</sup> for Africa, with less than one-tenth per capita income, and relatively poor Internet services. The call cost in Nigeria is US\$0.40 h<sup>-1</sup> while in Kenya it is US\$1.36.<sup>6</sup> ISP subscription rates vary widely in Africa between US\$10 and US\$100, a reflection of the relative competitiveness of the markets, varying tariff policies of telecom operators, differences in the regulations on private wireless data services and in the access to international telecom band-

width. Currently the most serious constraint to Internet adoption in Nigeria is the low level and inefficient fixed lines network that is equally constrained by inter-exchange congestion. In addition the European majority shareholders are expected to raise the level of technical managerial capability of the new firm.

In Kenya, the Internet has developed rapidly since the mid-1990s although rapid developments have been hampered by erratic, poor or non-existent telecommunication facilities in various parts of the country. In addition, high annual fee paid by ISPs tend to raise the barrier to entry leaving the state-owned company, Telkom is its quasi-monopoly position.

According to the Kenya ISPs, the problems facing the industry have less to do with the large number, than with the regulatory regime that created a telecommunications monopoly, Telkom. Telkom operates the main international Internet gateway in Kenya and a national 2 MBPS Internet backbone service, JamboNet. Almost all ISPs rely on this gateway for their upstream connectivity, although some of the larger ISPs use satellite broadcast links to augment their incoming bandwidth and lease separate data lines for backup purposes. The local ISPs maintain that lack of full deregulation of services is the main reason for poor services.

Between 1996 and 1999, ISPs could only get connected to the Internet through KENSTREAM operated by Telkom. Although from 1999, Telkom's JamboNet became an additional gateway for the ISPs to link their subscribers to the world at a lower cost. However, the facility's unreliability following intermittent breakdown proved to be very expensive for both the ISPs and consumers; the cost to the economy, even more. From the survey, respondents seem to take the view that ISPs could lower cost of services by expanding their users base. Although they also agree that while costs of subscription remain high, much has changed in the last year to move cost closed to what the ordinary academic may well afford.

## 3. A model for analysing the dynamics of ICT use

The dynamics of adoption and usage of ICTs could be examined at three levels, which are the macro- (national), meso- (sectoral), and micro- (organisational and individual) levels. The determinant variables while not mutually exclusive, can be broadly decomposed at these three levels (Fig. 1). At the macro- or national-level, the variables are largely structural and infrastructural namely, income per capita, telephone density, education, and culture proxied by language.<sup>7</sup> At the sectoral

<sup>4</sup> Digital transmission is measured in bits per second (BPS). Narrow band is a slice of bandwidth for transmission of voice and data signals. The T-1 (T-carrier) has an operating speed range of 2.6 kilobits per second (KBPS)–1.5 Megabits per second (MBPS). Wideband or broadband with deliver services at speeds between T-1 and T-3 (45 MBPS).

<sup>5</sup> See <http://www3.sn.apc.org/africa/>.

<sup>6</sup> There have been recent pledges (December 2001) from the government that it would be reduced 'soon'.

<sup>7</sup> English remains the dominant language of the Internet, however, Chinese, Spanish and Japanese are becoming important.

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