

Internet Virtual Classrooms in Developing Nations: Challenges and Opportunities towards Mass Literacy

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ABSTRACT

Advances in information and communication technology (ICT) are becoming vital to the social and economic developments of nations. ICT has offered ways to transact businesses and transformed citizens, firms and countries into knowledge based economic structures and data societies with electronically linked interdependent global relationships. Education in the 21st century is best positioned to utilize the opportunities offered by ICT to lift a higher percentage of the global population out of illiteracy and poverty. Specifically, through Internet, the international boundaries have shrunk and the movement and transfer of ideas across nations by industries, academia and individuals sky-rocked. For UNESCO and other organizations focused on facilitating global literacy especially in the developing nations, Internet Virtual Classrooms (IVC) would be pivotal to realizing their objectives faster and with lesser resources. This paper describes the challenges and opportunities in implementing and using IVC in developing nations. A practical framework is presented based on *TruSync*, an IVC platform optimized for freeware computer aided design (CAD) tools.

Keywords: education, developing nations, internet virtual classrooms, information technology, mass literacy

1. INTRODUCTION

Advances in information and communication technologies (ICT) are becoming central to the social and economic developments of nations. ICT has offered means to transact businesses and transformed nations and organizations into knowledge based economic structures and data societies with electronically linked interdependent relationships (Neocircuit, 2008). Education in the 21st century is best positioned to utilize these evolving ICT opportunities to lift a higher percentage of the global population out of illiteracy and poverty. This is important as statistics have increasingly shown that sound education policy is correlated with high national standard of living. Through Internet, the international boundaries have shrunk and the movement and transfer of ideas across nations by industries, academia and individuals sky-rocked. For UNESCO and other organizations focused on facilitating global literacy especially in the developing nations, Internet Virtual Classrooms (IVC) would be pivotal to realizing their objectives faster and with lesser resources.

There are different frameworks on IVC which have been proposed since Internet was identified as potential key driver for online and virtual education. The core of these frameworks lies on deploying multimedia and communicating systems to enable seamless connection of teachers and students for the purpose of learning and sharing ideas. Across the globe, many schools in the developed nations have exploited this IVC paradigm in their off-site or satellite campuses. Internet degree programs and Internet based continuing education programs have become popular. As Internet continues to advance and information systems become more powerful, IVC is expected to become more dominant. IVC can be used for all types of educational programs, and can be vital instrument towards transfer of technology from developing nations born experts in Diaspora to schools in their native countries.

Specifically, semiconductor technology has remained pervasive in shaping all aspects of modern commerce and industry. Being pivotal to many emerging industries in the 21st century, it occupies a central position in the global economy. Because Internet, medicine, entertainment and many other industries cannot substantially advance without this technology, it occupies a vantage position in engineering education in many developed nations. These nations invest heavily in microelectronics education as in the United States where the MOSIS (mosis, 2008) program enables students to fabricate and test their integrated circuits to enable full cycle design experience. On the other hand, developing nations increasingly lag behind in developing and diffusing this technology in their

economies owing to many factors which include human capital, infrastructure, among others. Notwithstanding, the Internet offers opportunities to bridge this widening gap by using IVC to harness the skills of experts in the developed nations and virtually export them to the developing ones. This paper describes the IVC challenges and opportunities in the developing nations and a platform developed for IVC.

2. WHAT IS INTERNET VIRTUAL CLASSROOM AND LAB (IVC)?

This is a ‘classroom’ on the Internet where instructors and students interact via computers (Fig.1). Besides lecture notes, VOIP (Voice over Internet Protocol) (Ekekwe, 2007, Las Vegas) phone, live-chats and online-conferencing are vital components of this classroom resources. It is basically a virtual learning environment where teacher and student, separated by time or space, through course management platforms, multimedia resources, the Internet, videoconferencing, etc interact and learn bi-directionally (Kurbel 2001, Loutchko 2002). The motivation is to create a virtual traditional classroom on the web and educate students separated by physical distance from the instructors.

A. The merits/drawbacks of IVC

- IVC is not limited by distance, allowing lectures to be delivered across national and continental boundaries.
- IVC offers the platforms to harness the brightest minds to teach a larger spectrum of students globally.
- At the long-run, the benefits of IVC supersede the cost of implementation.
- The main drawback of IVC, though video conferencing is eliminating it, is the impersonal delivery method which could be challenging to some students.
- The courseware and labware could be reused over time towards saving cost in the long-term. IVC offers a good archival capability to store and disseminate materials developed by leading experts.
- Another is the investment required from poor nations to fund high speed communication systems needed for IVC.
- To the developing nations, it provides a framework through which they can tap the pool of their experts in Diaspora which increasingly prefer to live in the developed nations.



Figure 1 IVC Network

3. CHALLENGES OF IVC DEPLOYMENT IN DEVELOPING NATIONS

There are many challenges to the deployment of IVC in the developing nations. Some are:

- Electricity: many developing economies still suffer sporadic electricity supply thereby making it extremely challenging to deploy the right technology to support IVC.
- Telephone facilities: though many developing economies are deploying better telecommunication infrastructure, the telephony is still unreliable. This has a potential to derail IVC.
- Broadband telecommunications: the advent of broadband telecommunication has to be pervasive in the universities across these nations to enable seamless integration of IVC.
- Computer systems: though efforts have been made in many schools to acquire computing systems, the ratio of computers to students remains very poor.
- IVC Accessories: IVC accessories or tools like video systems, cameras, speakers etc are expensive and not many schools can afford them with the low operational budgets.
- Lack of adequate manpower: the human capital is a fundamental challenge in the design and deployment of IVC. While trained experts are readily available in the cities, they remain in low numbers in some remote areas where some of the schools are situated.

Though these problems are widespread in the developing nations, some of the schools, especially the private ones which are better managed have good facilities. Consequently, they are well positioned to benefit through IVC the expertise and skills of experts across the globe. This opportunity is strategic considering the lack of enthusiasm from top global scholars in traveling to these regions owing to their transportation and safety problems.

4. IVC PLATFORMS

Many virtual classroom programs use e-learning platforms (learning management system – LMS) to administer and manage students and courses and consequently provide learning content (wikipedia, 2008). Examples of such systems include *WebCT*, *Moodle* and proprietary e-learning platforms like *Tooling University*. Other major ones are (wikipedia, 2008):

- *WiZiQ* (www.wiziq.com): This is a free platform which provides complete freedom of learning. It is equipped with live audio-video communication, chat, content sharing, and session recording capabilities. No download is required since it works with any web browser and operating system. When combined with Moodle, it is ready for real-time online collaboration and interaction.
- *Second Life* (secondlife.com): This platform offers 3D visualization and has become a virtual classroom for major colleges and universities around the world, including Princeton, Rice University, University of Derby (UK), Vassar, the Open University (UK).
- *WebEx* (webex.com) is increasingly used as an online learning platform and classroom for a diverse set of education providers. It is a Cisco Web Meetings and Collaboration Solution which has become popular because of its real time collaboration using an interactive whiteboard, chat, and VOIP technology that allows audio and video sharing. Combined with the legendary security of Cisco technology, this offers a good platform, though it is not free as WiZiQ or Moodle.

5. DESIGN AND DEPLOYMENT OF IVC

The Internet offers the core platform in designing the IVC. As shown in Fig 1, IVC is a network of Internet-connected computers which have been tailored for learning. These computers are equipped with audio, video, test-messaging capabilities with huge storage systems. In designing this system, quality is important to facilitate efficient transfer of ideas between the parties.

Considering the low budget of some of the schools in developing nations, thin client computing machines could be used. These computers do not have resident storage devices; rather they share a central storage system remotely. This has the potential of saving cost and making the system cheaper. Within the context of mass literacy, the fundamental infrastructures are still lacking; we focus on schools with broadband telecommunications and high speed computing systems.

As an experimental approach to test the effectiveness of IVC in teaching microelectronics in the developing nations, we developed a program to educate a small segment of students who showed interests in our movement for quality microelectronics education in Nigeria (neocircuit, 2008). We developed an IVC platform, *TruSync*. *TrySync*

is engineered to drive many freeware computer aided design (CAD) tools for the design of integrated circuits (Fig. 2) as documented in (Ekekwe, 2008 San Diego). It offers platforms for simultaneous phone, chat, text and video. This system will enable Nigerian experts in Diaspora to make academic contributions to the schools to help mitigate the impacts of African brain-drain. We will seek for standardizations towards implementing a system which would facilitate faster and efficient diffusion of the semiconductor and microelectronics technology. A full demo of *TruSync* will be shown during the conference.

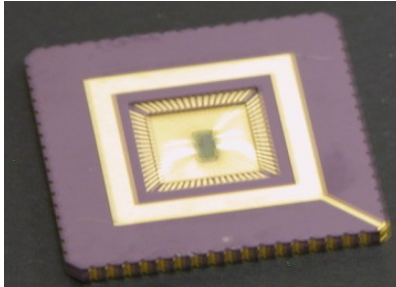


Figure 2 Integrated Circuit

6. CONCLUSIONS

As information and communication technology continues to shape all aspects of human endeavors, its application in education in the developing nations would be vital. These regions lack the human and institutional capabilities to deliver some of the emerging concepts to their teeming student populations. IVC if properly implemented will offer a highly needed solution to access the global pool of top scholars for these nations as well as educate the citizens en masse. Though complex, appropriate IVC deployment would facilitate mass literacy, technology acquisition and diffusion into developing economies.

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