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ABSTRACT

This case study is about the first Information Systems Ph.D. program in Ethiopia and the region, a collaborative effort of thirteen universities around the globe. Seventeen faculty members are traveling to Ethiopia to launch the program and plan to begin class summer 2008. This paper depicts the program design, program development, and an outline of the overall program. The authors share their personal experience in the development of this unique IS Ph.D. program.

Keywords

Higher Education, Tertiary Education, Ph.D. Program, Africa, Ethiopia, Addis Ababa University

INTRODUCTION

Information Technology (IT) has permeated the business and academic consciousness of economically developing countries. Many have established ministerial and directorate positions in IT and launched certificate programs, but advanced academic degree programs, especially Ph.D. programs, have lagged behind. This case study depicts the launch of an Information Systems (IS) Ph.D. program at Addis Ababa University (AAU) in Ethiopia.

Africa has a very low (<5% compared to 50% in the U.S.) enrollment in higher education (Bloom, Canning, and Chan, 2006). *"Today, more than ever before in human history, the wealth-or poverty-of nations depends on the quality of higher education. Those with a larger repertoire of skills and a greater capacity for learning can look forward to lifetimes of unprecedented economic fulfillment. But in the coming decades the poorly educated face little better than the dreary prospects of lives of quiet desperation." (*Gillis, M., President of Rice University, 12 February 1999). These thoughts are echoed by Paul Collier (2007) in his study of the bottom billion Increasing availability and enrollment in higher education must be part of the strategy for African countries to achieve economic growth and enmeshed in the global economy.

IT offers many countries the opportunity to create quickly a first world industry, as demonstrated by India's success with outsourcing. This model has spread to other countries, including the Philippines, Russia, Vietnam, Brazil, and Uruguay. Ethiopia has the basic ingredients (a large population, 80 million, to get economies of scale and English as the language of instruction for secondary and tertiary education) to build a successful IT outsourcing industry. First, it must create a cadre of professors who can educate those who will become the critical resource for such an industry.

This case study describes the design and development of Information Systems Ph.D. program at AAU. The lessons learned from this case study may serve as a guide for similar programs in other developing economies.

BACKGROUND

Higher education has been neglected in Africa (Bloom, et al., 2006). While Ethiopia has a history of higher education that dates back to 1711, formal establishment took place in 1947 at Alamaya University, a public university focusing on Agriculture, and in 1950 at AAU. These two universities remained the only higher education institutions until 1991. Between 1991 and 2007, Ethiopia's public universities increased from 2 to 23. The first private higher education institution, Unity College, was established in 1998. Today, there are three dozen public and private higher education institutions in the country.

The IS program is part of an overall Ph.D. program in the computing field. The formal degree is called a Ph.D. in Information Technology with six complementary tracks including: Information Systems, Information Retrieval, IP Networking & Mobile Internet, Language Technology, Software Engineering, and Wireless Communication Systems.

The proposed Ph.D. program complements the Ethiopian government's emphasis of Information and Communication Technology (ICT) as a key development agent. The government has established a vice ministerial position for ICT under the Ethiopian Ministry of Capacity Building and a directorate called Ethiopian ICT for Development Agency that overlooks federal government implementation of ICT applications. Ethiopia's vision to overcome underdevelopment by using ICT as a

strategic agent was articulated in a 2005 speech by the Prime Minister, Meles Zenawi, "…Now we believe we are too poor not to save everything we can and invest as much as possible in ICT. We recognize that while ICT may be a luxury for the rich, for us the poor countries, it is a vital and essential tool for fighting poverty, for beating poverty that kills and ensuring our survival…" (ICTs and Transformational).

To our knowledge the only terminal degree Ethiopia offers to-date is in medicine. The proposed Ph.D. program, the first of its kind in Ethiopia and the region, recognizes the Brain Drain challenge. Brain Drain, migration of skilled professionals out of economically developing countries, poses a real challenge to Ethiopia's ability to retain its graduates. The International Organization on Migration (IOM) estimated that Ethiopia lost 74.6% of its human capital from various institutions between 1980 and 1991 (IRIN, 2004). Another estimate shows that 60,000 Ethiopian professionals made up of physicians, professors, engineers, etc. left the country between 1985 and 1990 (Africa Brain Drain, 2003).

An estimate from 2003 showed a fifteen year average report indicating that 50% of Ethiopians who went abroad for advanced studies did not return. Many of these professionals go to the U.S. and U.K. The 2000 U.S. Census showed that Africans with bachelor and advanced degrees lead all other immigrant groups as shown in Figure 1 (U.S. Census, 2000).

Percentage of U.S. Adult Immigrant Population with a Bachelor's Degree or Higher in 1997 by Region of Birth

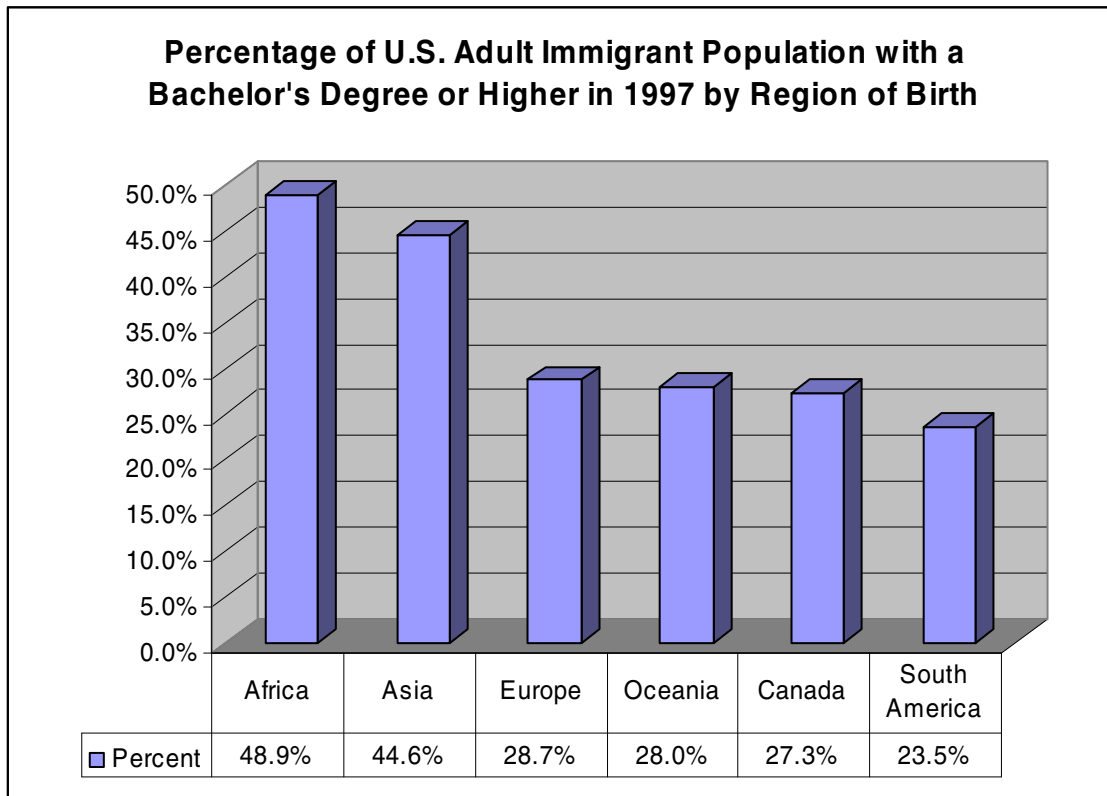|	Africa	Asia	Europe	Oceania	Canada	South America
■ Percent	48.9%	44.6%	28.7%	28.0%	27.3%	23.5%

Figure 1. 2000 U.S. Censes, Immigrant Population with Bachelor's Degree or Higher

The Census also showed that Africans with graduate degrees also lead all other immigrant groups (see Figure 2).

Percentage of U.S. Adult Immigrant Population with a Graduate Degree in 1997 by Region of Birth

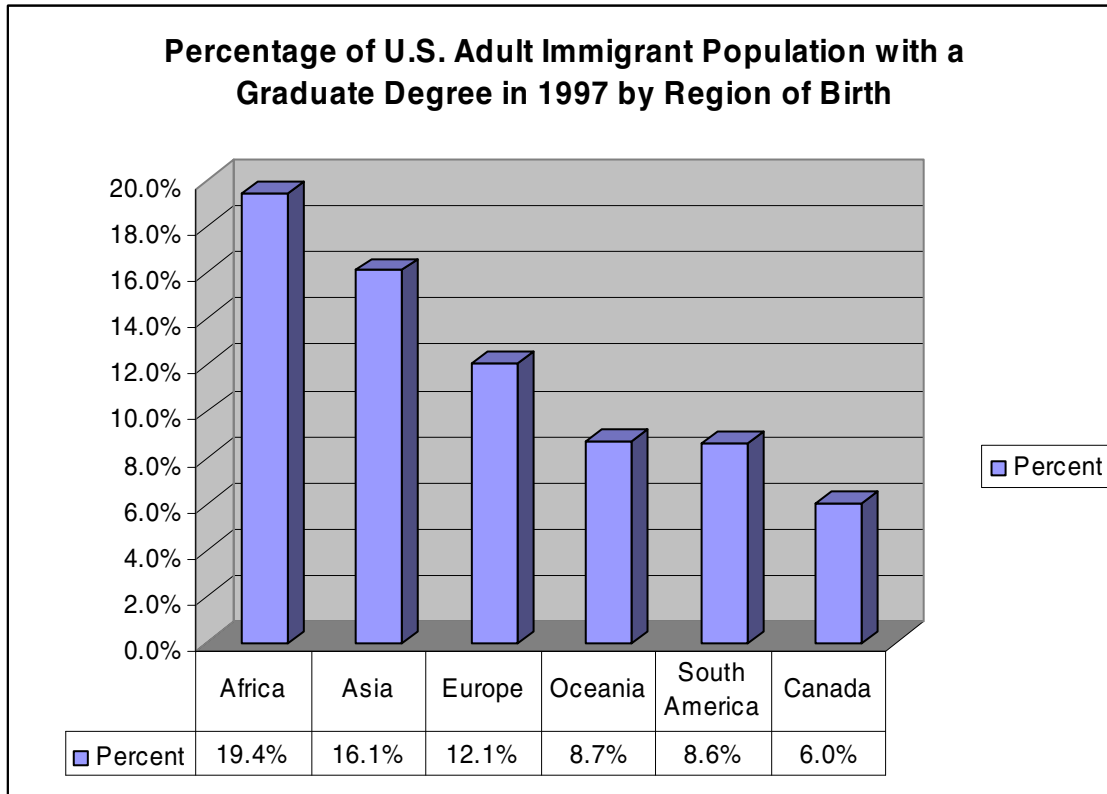|	Africa	Asia	Europe	Oceania	South America	Canada
Percent	19.4%	16.1%	12.1%	8.7%	8.6%	6.0%

Figure 2. 2000 U.S. Censes, Immigrant Population with Graduate Degree

Compared to the overall U.S. population average of 23.1% with college degrees and 2.6% advanced degrees, the 2000 Census showed that African immigrants lead in both groups (see Table 1).

Areas	U.S. Population	All Immigrants	African Immigrants	Asian Americans	Europe, Russia & Canada	Latin, South America & Caribbean
Not Fluent in English	0.6%	30.5%	7.6%	23.4%	11.5%	44.0%
Less Than High School	17.1%	39.1%	12.1%	21.2%	23.5%	57.4%
College Degree	23.1%	23.3	43.8%	42.5%	28.9%	9.1%
Advanced Degree	2.6%	4.2	8.2%	6.8%	5.8%	1.9%

SOURCE: 2000 US CENSUS; http://en.wikipedia.org/wiki/Africans_in_the_United_States

Table 1. 2000 U.S. Census, College and Advance Degrees

The overall migration of Africans with advanced degree is estimated at 20,000 annually (Emigration of Healthcare Professionals, 2006). The proposed Ph.D. program design must grapple with these realities and will fail Ethiopia if it

becomes another channel for the talent Diaspora. To mitigate this conundrum the proposed Ph.D. program is designed as a resident program. The international faculty travel to Ethiopia in lieu sending the students abroad.

PROGRAM DESIGN

The Ph.D. program was conceived by a consortium of academic departments that offer masters degree in the computing field, including three at AAU: Computer Science, Information Science, and Electrical & Computer Engineering, and the Departments of IT and Telecom Engineering in the College of Telecommunication and Information Technology.

The primary objective of the program is to build the doctoral candidates' capacity to identify and solve problems related to IT development challenges in Ethiopia by applying technical and scientific methods and innovative tools independently. The program aims at preparing the candidates for successful academic and professional careers in both national and international markets. It should also aim, in our opinion, to foster the development of Ethiopia as an IT outsourcing center through the courses it offers, skills developed, and the research undertaken. It would be a great shame and loss to Ethiopia, if the PhD program becomes an entry point to a career in the developing world.

The Ph.D. program is modeled as a hybrid between the European research only model and the U.S. model of course work, comprehensive exam, and dissertation. It is intended to span 3-4 years with course work in the first year and dissertation research in subsequent years. Doctoral candidates are expected to complete a Masters degree in a related field before admission to the Ph.D. program. Incoming doctoral students will join a cohort in their track with a minimum of five students per cohort.

Over 200 Ph.D. holders are needed to meet current demand for teaching at public universities. This projection is only for public academic institutions, not including private institutions, industry, and other R&D needs.

AAU has only one Ph.D. holder in IS; this understandably creates a challenge in teaching and dissertation advising. The proposed program will use international and local faculty to address these challenges. The international faculty will take the lead role in teaching a class; more than one international faculty may collaborate to teach a class. A local faculty member will be designated as a facilitator for each class. The local facilitator works with the international faculty, administers the course, and supports students. The international faculty will mentor the facilitator. At least one international professor for each course will travel to Ethiopia for 2-3 weeks of intensive face-to-face instruction.

The dissertation will be chaired by an international faculty. The dissertation process requires intense collaboration between the student and the dissertation advisor(s). While the proposed program intends to use collaboration technologies to facilitate communication between the student and international faculty, bandwidth intensive, synchronized technologies (e.g., video conferencing) are often unreliable, especially in Ethiopia. To overcome this challenge, a local professor from a related discipline will provide local advising. While the international advisor will focus on content the local faculty will provide advice on the dissertation process. We expect that email will be widely used because of its limited bandwidth needs and time zone difference between Ethiopia and the U.S., an expected source of many remote supervisors.

A supporting e-Learning infrastructure is needed for both teaching and dissertation advising. An open source e-Learning infrastructure with content management system and collaboration tools will be used. A server in the U.S., at Kennesaw State University, and a backup server in Ethiopia, at AAU, will be setup. International faculty will post their teaching and advising material in the U.S. server. The local facilitator and students will have access to the U.S. server, access to Internet connectivity notwithstanding. As a backup the contents of the U.S. server will be synchronized with the AAU server.

Funding for the program was received from the Ethiopian government, the governments of Germany, France, and Dutch, and the World Bank. The five year budget is estimated at US $5-6 million. While sustainability is part of the program design, it is beyond the scope of this paper. The proposed program design includes doctoral candidate funding as part of a research center under the doctoral program. The research center will coordinate research request from government and industry sectors. Doctoral students with the support of faculty will undertake research including dissertation work. The research center will coordinate research requests, manage payments, manage the practicum, identify faculty supervisors for the research, and avail research topics for doctoral students. Doctoral candidates will also be required to teach in higher education.

PROGRAM DEVELOPMENT

Planning for the Ph.D. program started in 2006 with the leadership of Mr. Tesfaye Biru, former Vice President for Business & Development at AAU. A consultative meeting among the two initiating institutions AAU and the College of Telecommunication and Information Technology was conducted to garner broader support for the initiative (International Workshop, 2007).

Subsequent to approval by the initiating institutions a two day international workshop was held to discuss the structure and operation of the program (International Workshop, 2007). Eight universities participated in this first international workshop including: Aalesund University College from Norway, Addis Ababa University, College of Telecommunication and Information Technology, Freie Universitat of Berlin from Germany, Johannes Kepler University Linz from Austria, Kennesaw State University from U.S., University of Cape Town from South Africa, and Universitat Hamburg from Germany. The participants agreed to begin the program launch with two tracks: software engineering and information systems. Dr. Christiana Floyd from Universitat Hamburg and Dr. Solomon Negash from Kennesaw State University were identified to coordinate international faculty participation for the software engineering and information systems tracks, respectively.

The IS curriculum was developed by fifteen international faculty from seven institutions including Claremont Graduate University, Georgia Institute of Technology, Georgia State University, Kennesaw State University, Royal Melbourne Institute of Technology, Southern University and A&M, and the University of Georgia; with coordination by Kennesaw State University. The international team worked with AAU faculty to create synergy with other tracks and finalize the curriculum. The curriculum was subsequently approved by the AAU senate. The approved courses are shown tables 2 and 3.

Course #	Course Title	Hrs
CIT 820	Systems Thinking and Sustainability	3
CIT 821	Advanced Topics in Info. Systems	3
CIT 822	Research Methods in Info. Systems	3
CIT 823	Advanced Seminar in Info. Systems I	1
CIT 824	Advanced Seminar in Info. Systems II	1
CIT 825	IT Management, Leadership, and Implementation	3

Table 2. List of Required Courses

Course #	Course Title	Hrs
CIT 826	Business Process Innovation	3
CIT 827	Information System Security: Processes, Technologies, and Management Issues	3
CIT 828	Business Intelligence, Data Warehousing, and Data Mining	3
CIT 829	Knowledge Management	3

Table 3. List of Elective Courses

In developing the curriculum, the international faculty considered two important needs, beyond the need to provide education in IS research skills and scholarship. First, they identified the need for an "appropriate education." The developed economy research model, particularly as implemented in the U.S., emphasizes theory building. The faculty felt that a developing economy needs to emphasize building practice so that the lag time between the investment in an advanced IS education and the return to the community is shortened. Thus, it recommended that dissertations should be field based with the intent of improving the IS practices in Ethiopia. Thus, highly relevant research methods for the program are case studies and action research.

Second, they urged AAU to pay attention to the most important problem facing the world; How do we build a sustainable environment? In particular, how do we build information systems that support sustainable organizational and societal practices? Thus, this Ph.D. program might well be unique in the world, because it contains a course titled "Systems Thinking

and Sustainability." Consequently, the students and faculty in this Ph.D. program have a unique opportunity to lead the world in one area of IS Ph.D. education. It is fitting that a new Ph.D. program should stimulate new thinking about a critical problem.

Applicants with Masters degree must take 20 credit hours. Six required courses (four courses with three credit hour and two advanced topic courses with one credit hour) that make up 14 credit hours and two elective courses with three credit hours to complete the 20 credit hours requirement. The course work is designed to be completed in one year.

Doctoral candidates must write and orally defend their dissertation. Students are expected to defend their dissertation proposal at the beginning of their second year, following completion of their course work. The two advanced seminar courses with one credit hour each are designed to support the student's dissertation activities.

The program launch has received national media coverage. Student recruitment is through word of mouth primarily among instructors at AAU. Ten potential doctoral students have shown interest in the IS Ph.D. program. All interested candidates have a Masters degree in a related field including business, library information, or computer science. The program gives priority to instructors teaching at AAU. AAU has agreed to maintain salary compensation while reducing workload for instructors who join the Ph.D. program.

A number of professors representing a dozen universities have volunteered to participate in this program, see table for participating institutions (See Table 4).

	Institution	Country	# of Professors
1	Appalachian State University	Boone, North Carolina, USA	2
2	Claremont Graduate University	Claremont, California, USA	2
3	Georgia Institute of Technology	Atlanta, Georgia, USA	2
4	Georgia State University	Atlanta, Georgia, USA	2
5	German University in Cairo	Cairo, Egypt	1
6	Kennesaw State University	Kennesaw, Georgia, USA	4
7	Oakland University	Rochester, Michigan, USA	1
8	Royal Melbourne Institute of Technology	Melbourne, Australia	3
9	Southern University and A&M	Baton Rouge, Louisiana, USA	2
10	University of Cape Town	Cape Town, South Africa	1
11	University of Georgia	Athens, Georgia, USA	3
12	University of Oslo	Oslo, Norway	3
13	University of Pennsylvania	Philadelphia, Pennsylvania, USA	1

Table 4. List of Universities Participating in the AAU IS Ph.D. Program

The software engineering track held an opening session, January 2008, and began classes. The IS track has scheduled an international workshop, March 27-29, 2008, to formally begin its program. Seventeen international faculty from eleven institutions, see Table 4, are traveling to participate in this workshop. The workshop goals are: open the IS track formally, review application of potential students, schedule classes, structure teaching format, structure dissertation advising format, and install an e-Learning infrastructure. The IS program plans to begin classes in the 2008/2009 school year.

Participating faculty will present their research agenda. Ten potential doctoral candidates have requested to present their research interests at the workshop.

FUTURE DIRECTION

The authors plan to follow up on the implementation of this unique IS Ph.D. program. Lessons learned from this case study will advance our knowledge on how to establish IS Ph.D. programs in an economically developing country that is both appropriate for the country and also contributes to the world's knowledge on sustainability. The international collaboration and teaching and research modalities proposed in this program will be of interest to the academic community.

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