2006-1268: BRAIN DRAIN CONCERNS IN TECHNICAL CAPACITY BUILDING EFFORTS

Russel Jones, World Expertise LLC

Russel C. Jones is a private consultant, working through World Expertise LLC to offer services in engineering education in the international arena. He previously served as Executive Director of the National Society of Professional Engineers. Prior to that, he had a long career in education: faculty member at MIT, department chair in civil engineering at Ohio State University, dean of engineering at University of Massachusetts, academic vice president at Boston University, and President at University of Delaware. Dr. Jones is President of the Committee on Capacity Building of the World Federation of Engineering Organizations.

Brain Drain Concerns in Technical Capacity Building Efforts

Abstract

WFEO and UNESCO, among other organizations, are engaged in major efforts at building technical capacity in developing countries, with an aim of promoting economic development and engagement in the technology-based global economy there. A base of well-educated engineers is seen as a primary requisite for economic development in such countries. Such a pool of well qualified and certified graduate engineers can lead to direct foreign investment by multi-national companies, more effective utilization of foreign aid monies, and small business startups through entrepreneurship. Mobility of work (offshore outsourcing) and of engineers across national borders is one result of such capacity building efforts. But observers in developing countries raise the concern that the investment in building additional technical capacity there will simply lead to accelerated brain drain, with the enhanced pool of engineers likely to leave for jobs in developed countries. This paper explores the dynamics of technical capacity building in developing countries, and provides case studies of successful efforts.

Introduction

In the global economy of the 21st Century, engineers play a key role in overall economic development for countries and regions. In the well developed countries, the role of the engineer is well understood and utilized. In much of the developing world, however, the available pool of engineering talent is typically below critical mass – and economic development and even important basic societal needs that rely on engineering – such as clean water supply and sanitation – lack the technical talent to address them.

Technical capacity building efforts, such as those being pursued by the World Federation of Engineering Organization and UNESCO, aim at developing a sufficient pool of well educated and certified engineering graduates in developing countries to effect three desirable outcomes:

- Technical capability is needed for developing countries to engage effectively in the global economy; direct foreign investment, international trade, mobility of engineers, and the flow of work to countries with cost effective talent will result.
- Indigenous science and technology capacity is needed to insure that international aid funds are utilized effectively and efficiently – for initial project implementation, for long-term operation and maintenance, and for the development of capacity to do future projects. And a sufficient pool of engineers can enable a developing country to address the UN's Millennium Development Goals effectively, including poverty reduction, safe water and sanitation, etc.

- In order to stimulate job formation, a technical workforce pool is needed, made up of people who are specifically educated and prepared to engage in entrepreneurial startup efforts that meet local needs

One of the issues of concern in capacity building efforts in developing countries that do upgrade and enhance both quality and quantity of engineering graduates is that a brain drain will occur, with many of the best engineers moving to lucrative positions in developed countries. The following discussion addresses those concerns, makes suggestions on how to control brain drain, and cites examples of successful national efforts which have overcome it.

Brain drain concerns

In many developing countries, significant numbers of engineers are graduated at the bachelor's level. In many cases they are of less than desirable quality, with a considerable amount of their time at a university spent in remediation of primary and secondary school shortfalls. Many of these graduates stay in the developing country doing routine work – but often the better graduates go on to post-graduate study in a well developed country. With a master's or doctoral degree from a recognized engineering program in a developed country, these advanced level engineers will often choose to seek employment in a developed country rather than returning to their home nation. This phenomenon is popularly referred to as "brain drain".

Even when post-graduate education is done in the home country of an engineering graduate, he or she may immigrate to a developed country for employment – attracted by stimulating jobs and higher compensation. Such mobility is inevitable due to economic pressures, and to the lack of challenging and rewarding jobs in the native countries. It likely cannot be stopped by ethical and patriotic arguments, by requirements that the graduate work in the home country, or by a tax to recoup the costs of the engineering education in the native land. Such attempts would simply provide a driving force for students who want to study engineering to go abroad even earlier, making it even less likely that they will ever return to their country of origin.

Trying to stem brain drain by legal action should be evaluated in the light of recent experience with offshore outsourcing in the US and other developed countries. Economic competitiveness has demanded that corporations become more international, and take advantage of more cost effective labor pools in developing countries. Efforts to legislate bounds on such offshoring have been blunted by the reality that corporations will simply move whole operations offshore if constraints are placed on outsourcing of portions of operations to more cost-effective locations. The parallel with human brain drain should be obvious.

What is needed?

First and foremost, a large enough pool of high quality, accredited engineering graduates is needed in developing countries so that the good results listed above can be realized. It must be recognized that there will be some leakage of these graduates to jobs in developed countries, but many will choose to stay where family ties and native country culture provide a comfortable environment.

But the basic need is the creation of good jobs in the home country. This is a chicken-and-egg issue. Increased demand for engineers will result only when there is a sufficient pool of well qualified graduates to attract direct foreign investment, multinational corporation operations, offshore outsourcing from developed countries, and entrepreneurial startups. Developing country planners and government officials must pursue effective economic development and job generation strategies in parallel with making the needed investments to enhance the quality and quantity of engineering graduates.

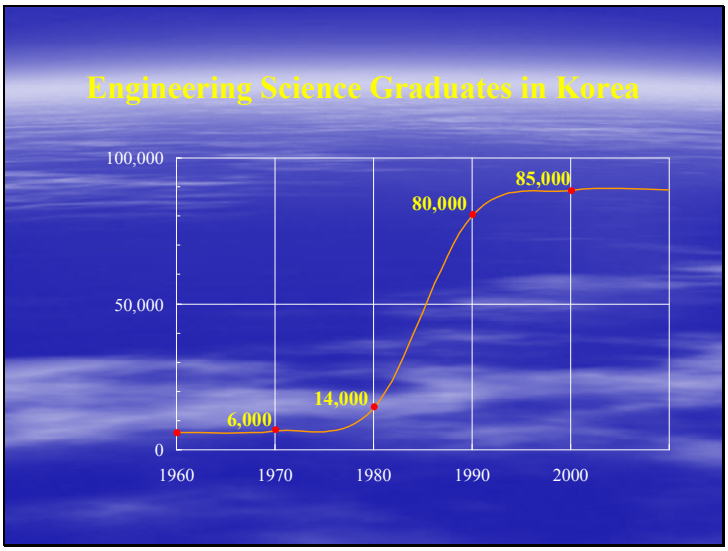
Engineering education in developing countries should include significant coverage of entrepreneurship – how to start, operate, and grow a small business. Note that US companies such as Hewlett-Packard, Microsoft, and Yahoo all were started in garages by enterprising young people with a technical bent. Engineering graduates should be equipped to take a path of creating jobs rather than seeking one if they wish to do so.

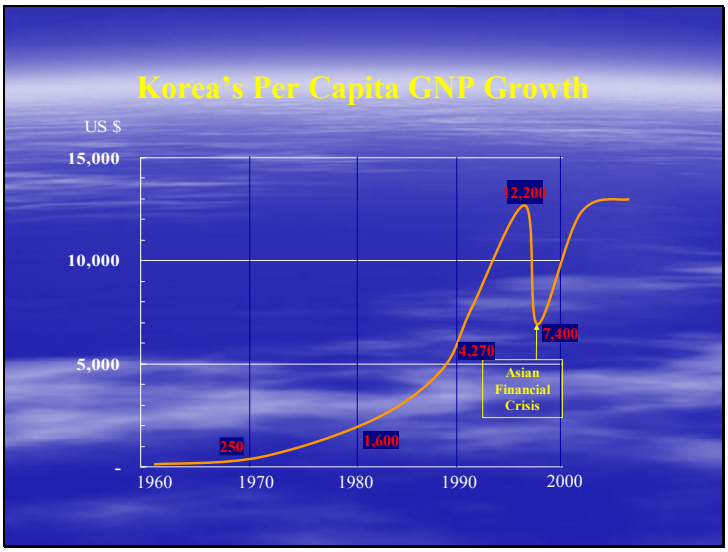
As technology based economies grow in developing countries, one important source of top talent – in addition to new engineering graduates – is the return of previous emigrants from the diaspora. As will be shown later, several countries that are developing well have benefited from the return of former citizens who see new opportunities in their home countries, and bring back foreign experience and network contacts to the benefit of their home countries.

In addition to increasing the number and quality of engineering graduates, and pursuing strategies to have good local jobs available, developing countries need mechanisms to apply research and development results from local universities and companies for economic gain. Such mechanism as incubators and small business development financing are need in the mix.

Examples of successful countries

Several emerging developing countries can be cited to show how major investments in technical education have reaped many benefits in the global marketplace. South Korea, for example, has made massive investments in increasing the number and quality of engineering graduates over the past three decades – and major economic growth has followed as industries such as automobiles, electronics, and communications have grown to meet internal needs as well as extensive international trade. The following two graphs show how a ten-fold increase in the number of engineering graduates over less than three decades has contributed to a similar increase in the growth of the country's economy.





Figures 1a and 1b – South Korean trends in engineering graduates and in gross domestic product growth (Source: Presentation by South Korean delegation to Capacity Building Forum at 2004 Annual Meeting of the American Society of Civil Engineers)

Similar results have been achieved in other countries. In India, some 50 years of investment in high quality engineering institutions – the Indian Institutes of Technology – have resulted in a pool of graduates that now is having major impact in the global economy. Many IIT graduates have emigrated to the US and Western Europe, but as increasing numbers of the graduates have chosen to stay in India to build local software and design operations, many graduates are staying in their home country – or returning

there from abroad. The development of high-tech cities such as Bangalore, with stimulating and well paying jobs, has been key to stemming the earlier brain drain.

Taiwan provides a similar example, where investments in engineering education and vehicles to bring R&D to market as valuable products and services has provided local jobs for recent graduates and has attracted former émigrés back. The final example is the Peoples Republic of China, where massive investments are being made to graduate more and better engineers locally, and they are being attracted to stay at home for their careers due to good job opportunities as the Chinese economy expands.

The moral to the story is that appropriately large investments in enhancing the quantity and quality of engineering graduates in developing countries pays off in local economic development – and that while brain drain may be an issue in early years, new graduates and returnees will stay at home as the economy develops to provide good job opportunities there.

Conclusions

Technical capacity building in developing countries provides a major path forward for sustainable economic development there. Enhanced engineering education – producing more and better engineering graduates – is key to such technical capacity building. But economic development and job creation planning must also be pursued – to complete the chicken and egg scenario that will keep good engineering graduates in their home countries. Brain drain may be a concern in early years of a major technical capacity building effort, but several case studies of successful emerging countries indicate that as the economy develops and good job opportunities are provided at home, engineering graduates will choose to stay in their home cultures and contribute to further sustainable economic and social development.

Bibliography

1) Dominique Guellec, *Brain Drain,* SciDevNet, http://www.scidev.net/dossiers/index.cfm?fuseaction=dossierfulltext&Dossier=10

2) William J. Carrington and Enrica Detragiache, "How Extensive us Brain Drain", *Finance and Development,* June 1999, http://www.imf.org/external/pubs/ft/fandd/1999/06/carringt.htm

3) Robert Cohen, "Brain Drain Migration", South African Commission on International Migration, 1996-97, http://www.queensu.ca/samp/transform/Cohen1.htm

4) Anna Lee Saxenian, "The Bangalore Boom: From Brain Drain to Brain Circulation?", *Bridging the Digital Divide: Lessons from India,* *http://www.sims.berkeley.edu/~anno/papers/bangalore_boom.html*

5) Mario Cervantes and Dominique Guellec, "The brain drain: Old myths and new realities, *OECD Observer,* May 2002, http://www.oecdobserver.org/news/fullstory.php/aid/673/The_brain_drain:_Old_myths,_new_realities.html

6) Michael Kanellos, "Perspective: Explaining the tech brain drain", *CNET News.com,* 13 February 2003, http://news.com.com/2010-1071-984334.html

7) Obaid Younossi, "A brain drain threatens Afghanistan's future", *International Herald Tribune,* 9 February 2006, http://www.iht.com/articles/2006/02/09/opinion/edyounossi.php

8) Joan Dassin, "Brain Drain Is Not Inevitable", *Inside Higher Ed,* 14 February 2006, http://insidehighered.com/views/2006/02/14/dassin

9) Dhananjayan Sriskandarajah, "Reassessing the Impacts of Brain Drain on Developing Countries", *Migration Information Source,* 1 August 2005, http://www.migrationinformation.org/Feature/display.cfm?id=324

10) Gumisai Mutume, "Reversing Africa's 'brain drain'", *Africa Recovery, July 2003, http://www.un.org/ecosocdev/geninfo/afrec/vol17no2/172brain.htm*