

## **Technical Capacity Building in Developing Countries to Promote Economic Development**

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### **Abstract**

In the pursuit of a more secure, stable and sustainable world, developing countries seek to enhance their human, institutional and infrastructure capacity. To do so they need a solid base of technologically prepared people in order to effectively improve their economies and quality of life. Such a base of qualified engineers and technologists will facilitate the infusion of foreign capital through attraction of multinational companies to invest in the developing country, assist in making the most of foreign aid funds, and provide a basis for business development by local entrepreneurs. In a coordinated approach, UNESCO and the World Federation of Engineering Organizations are mounting major efforts at technical capacity building in developing countries.

### **Introduction**

Economic development for developing countries can be effectively stimulated by building the technical capacity of their workforce, through quality engineering education programs. A competent technical workforce base can then provide several paths to economic development: attraction of technically oriented multi-national companies, who can invest effectively in the developing country once there is a cadre of qualified local employees available; effective utilization of foreign aid funds, providing a legacy of appropriate infrastructure projects and technically competent people to operate and maintain them; and small business startups by technically competent entrepreneurs. Both UNESCO and the World Federation of Engineering Organizations are currently actively engaged in technical capacity building in developing countries, and their efforts will be reported in this presentation.

High quality engineering education is a necessary forerunner to such economic development; and quality assurance systems such as peer review based accreditation are needed to promote such high quality education programs. Such quality assurance systems can then provide the basis for cross-border recognition systems, permitting the flow of services and goods across national boundaries. This presentation provides the rationale for quality assurance systems in promoting effective technical capacity building for economic development, and reports on one interesting effort currently underway (“Engineering for the Americas”).

## **The need**

*“Let me challenge all of you to help mobilize global science and technology to tackle the interlocking crises of hunger, disease, environmental degradation and conflict that are holding back the developing world.” - Kofi Annan, United Nations, 2002*

*“We need to encourage international commitments to promote the kind of engineering and technology that contributes to lasting development around the world.” - Koichiro Matsuura, UNESCO, 2000*

Capacity building is a dedication to the strengthening of economies, governments, institutions and individuals through education, training, mentoring, and the infusion of resources. Capacity building aims at developing secure, stable, and sustainable structures, systems and organizations, with a particular emphasis on using motivation and inspiration for people to improve their lives.

## **Previous efforts**

In a detailed study of the results of foreign aid to developing countries over the past several decades, William Easterly concludes, in his book “The Elusive Quest for Growth” (MIT Press, 2002):

- *Previous efforts have tried to use foreign aid, investment in machines, fostering education at the primary and secondary levels, controlling population growth, and giving loans and debt relief conditional on reforms to stimulate the economic growth that would allow these countries to move toward self sufficiency*
- *all of these efforts over the past few decades have failed to lead to the desired economic growth*
- *these massive and expensive efforts have failed because they did not hit the fundamental human behavioral chord that “people respond to incentives”*

Having concluded that past efforts at stimulating economic growth in developing countries have failed, Easterly outlines what he thinks would work. He argues that there are two areas that can likely lead to the desired economic growth in developing countries, and can lead them toward economic self sufficiency:

- utilization of advanced technologies, and
- education that leads to high skills in technological areas

## **What outcomes are desired?**

- Technical capability is needed for developing countries to engage effectively in the global economy.

A base of qualified engineers and technologists will facilitate the infusion of foreign capital through attraction of multinational companies to invest in the developing country

- 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.

An approach based on a solid indigenous engineering manpower pool serves to reduce brain-drain, showing people that they can partner with donor nations in helping build their own homelands.

- 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

A well prepared engineering workforce, when coupled with entrepreneurship, can result in societal as well as personal benefits.

Two complementary approaches are being pursued in parallel to achieve these desired outcomes:

- UNESCO “Engineering for a Better World” proposal, to enhance engineering programs within that organization
- WFEO Committee on Capacity Building, to provide an action oriented program for forward motion

### **UNESCO plans for capacity building**

In 2003, the United States of America rejoined UNESCO after an absence of 18 years. The US government indicated to UNESCO that it wanted a significant portion of the increased funds that it would provide to its budget to be allocated to enhancing its programs in engineering and engineering education. A major proposal on how to mount an enhanced program, entitled “Engineering for a Better World”, has been developed by the US engineering community and UNESCO’s engineering staff and submitted to UNESCO for consideration.

The overall objectives of the “Engineering for a Better World” proposal are to strengthen human and institutional technical capacity in developing countries, to promote engineering to young people, and to provide an interactive and catalytic role for the application of engineering and technological resources to sustainable economic and social

development and poverty eradication. There is specific reference to the Millennium Development Goals of eradicating extreme poverty and hunger, ensuring environmental sustainability, promoting gender equity and empowering women, and developing global partnerships for development.

UNESCO is also considering a new cross-sectoral effort in capacity building that would involve the science sector, the education sector, and the communications sector. This effort, to be housed in the science sector and reporting directly to the Assistant Director General for Science, would focus broadly on building personal and institutional capabilities in developing countries to address poverty reduction, economic development, and related issues.

### **WFEO Standing Committee on Capacity Building**

Motivated by a renewed interest in engineering and engineering education at UNESCO, at least partially driven by the decision of the United States of America to rejoin UNESCO after an 18 year absence, the World Federation of Engineering Organizations (WFEO) Moved in October 2003 to establish a new Standing Committee on Capacity Building, with the United States as the host of the international organization. The activities of the new Committee will include:

- Providing pathways for the technical and professional societies of the developed world to make their expertise available to engineers in the developing world – including technical publications, conferences, codes of practice, and ethics
- Utilizing state-of-the-art distance learning technology to deliver needed information and interactions to engineers and engineering educators in developing countries
- Strengthening engineering education, both initial and lifelong learning, in developing countries – including making available global best practices in curriculum reform and engineering practice
- Providing an information resource for teaching and learning materials, laboratory equipment, software, etc. for the engineering education needs of developing countries
- Addressing pipeline and diversity issues in providing the needed quality and quantity of engineers for the world's needs
- Promoting collaborative efforts between institutions in the developed and developing worlds
- Promulgating quality assurance standards and accreditation for engineering education throughout the world, particularly in developing countries

- Developing pathways for engineering volunteers in the developed world to spend time and effort working on capacity building in developing countries – including efforts in times of disaster relief

The WFEO Committee on Capacity Building, while hosted in the United States by the American Association of Engineering Societies, is an international committee consisting of members from both developing and developed countries. Members have been nominated by the some 80 member organizations of WFEO. A first meeting of the Committee on Capacity Building – a planning conference – was held in June 2004, in Washington DC. A second meeting, focused on pursuing an action oriented agenda, was held in Shanghai in November 2004, in conjunction with the World Engineering Conference.

It is anticipated that the WFEO Committee on Capacity Building will develop significant financial resources outside the UNESCO structure, and will operate programs which synergistically support the activities within the “Engineering for a Better World” program and the capacity building efforts within UNESCO. To date some \$50,000 of funds provided by the National Science Foundation have been allocated for startup activities of the WFEO effort, including the June planning meeting of the Committee. Additional funds have been earmarked for the committee through a US government extrabudgetary allocation to UNESCO. It is anticipated that at steady state, the activities listed above will require a support level of approximately \$500,000 per year – with the bulk of the activities heavily supported by volunteer time and effort of the millions of engineers represented by the WFEO member country organizations.

Following is a list of the activities being pursued by the WFEO Committee on Capacity Building:

- Engineering for the Americas – capacity building throughout Latin America and the Caribbean, utilizing both a ‘bottoms-up’ approach involving initiatives for engineering educators and a ‘top-down’ approach with policy level decisions at the Ministerial level of government
- African initiative – development of programs for the enhancement of engineering education and its quality assurance in six countries which currently have major foundation grants to improve their overall higher education
- Virtual exhibit, e-conferences – capturing of exhibits at a major engineering education conference (book displays, equipment demonstrations, hardware and software products, information services, etc.) to make available on a cd-rom to engineering educators in developing countries; planning and conducting of electronic conferences, such that engineering educators in developing countries can participate in virtual meetings even though typically unable to travel to live conferences
- Entrepreneurial conference – planning for a 2006 international conference on teaching entrepreneurship to engineering students

- Black Sea University Network workshop – planning for a fall 2005 workshop on best-practices in engineering education, to be held in Moldova for the dozens of engineering schools within the 100-member Black Sea University Network
- Gender issues – collaborating with two major international organizations concerned with gender issues in engineering education, to assist in getting more appropriate women into the engineering education pipeline, and on into engineering practice
- South-south interactions – collaborating with a moderately developed country to provide programs that have such countries utilize their expertise to assist lesser developed countries
- Engineers without borders – collaborating with younger engineers involved in the growing ‘engineers without borders’ movement internationally
- UNESCO/WFEO Expert Conference – Planning a major international conference on aspects of engineering education relevant to capacity building and poverty reduction, to be co-sponsored with UNESCO

“Engineering for a Better World” is a call to action from the United Nations. The WFEO Committee on Capacity Building is the response of the engineering profession throughout the world in the form of a strategic action agenda.

## Conclusion

*Developing countries need to be taught how to fish, rather than continually having fish provided to them by the developed world.*

State-of-the-art science and technology capacity must be built in developing countries if they are to be able to compete effectively in the global economy. A well-educated technical workforce pool must be in place in a developing country before technology-based multinational companies will be attracted to make investments there in production facilities and other areas. The day is past when such companies would simply introduce expatriates from developed countries to attempt such operations. Current political and economic realities require that a well-educated and trained indigenous workforce is needed to sustain technically based industrial operations in developing countries. Recent offshoring of operations to countries like India and China by companies in well developed countries illustrate this point.

A technical workforce pool is also needed to fuel entrepreneurial startup efforts that meet local needs. Well-educated engineers and scientists in developing countries will find appropriate ways to extend R&D results to marketable products and services responsive to local needs – to their personal economic benefits as well as to the economic benefit of their countries. Further development of such entrepreneurial startups can lead to products and services that profitably extend to regional markets, and eventually global markets.

Indigenous science and technology capacity is also needed in developing countries to assure that international aid funds sent there are utilized effectively and efficiently – both

for initial project implementation and for long term operation and maintenance. Too often in the past, major projects in developing countries have failed to meet desired and designed objectives because there is not a local base of technically qualified people to assist in implementation in ways that are compatible with the local culture and environment.

Thus it is clear that developing countries need their own indigenous technological expertise. They cannot afford to buy it from developed countries, and even when technical expertise from developed countries is provided by external funding it is often ineffective in appropriately responding to local needs and constraints. Capacity building of technical expertise in developing countries is thus key to enhancing their ability to become economically self-sufficient.

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