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QUALITY OF ENGINEERING EDUCATION

Number 9
November 2002

WFEO

UNESCO

Committee on Education and Training
World Federation of Engineering Organizations

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WORLD FEDERATION OF ENGINEERING ORGANIZATIONS
FEDERATION MONDIALE DES ORGANISATIONS D'INGENIEURS

COMMITTEE ON EDUCATION AND TRAINING

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Editor: Prof. János Ginsztler
H-1111 Budapest, Műegyetem rkp. 9.
phone: (36 1) 463-2471
e-mail: ginsztler@mti.bme.hu

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H-1012 Budapest, Logodi u. 49., tel.: (36 1) 214-2453,
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Quality of Engineering Education

Prof. János Ginsztler—President of the WFEO Committee on Education and Training

"The educational environment should stimulate students and encourage them to develop the capacity for life-long learning as a preparation for tackling the unknown problems which will occur in future decades." (Vernon John (United Kingdom): Engineering education - finding the centre or "back to the future", European Journal of Engineering Education, Vol. 25. Number 3, September 2000, p. 215-225)

My former professor, late Dr. László Gillemot also had similar opinion about the educational environment and about the quality of Engineering Education. He always underlined, that this quality can be evaluated through the ability of our students to solve unknown problems in the future, which ability must develop during their participation in the recent engineering education.

The Engineering Education as a part of Higher Education represents a well-defined position in the service sector. Its quality is depending on many factors, which will be - partly - discussed in this issue. All universities would like to sell their "products" in a globalized world-market, so it belongs to their basic interests to guarantee the highest quality.

The New Oxford Dictionary distinguishes two main meanings of quality. Quality used as a synonym for excellence or a degree of excellence. In this meaning quality can also be thought of as the "best of its kind", a standard against which similar things are measured. In the second meaning, quality is defined as a distinctive attribute or characteristic possessed by someone or something. In this meaning excellence is not normally an issue. Although the meanings are separate it is very difficult to talk about "quality as excellence" without also involving "quality as attribute". (Michael Christie (Sweden) - Hetty Grunefeld (The Netherlands) - Gerda Thibaut (Belgium): Modelling quality. European Journal of Engineering Education, Vol. 26. Number 4, December 2001, p. 441-450)

The 21st century will see the world becoming a genuine global village willingly or unwillingly through science, engineering and technology, particularly through the unstoppable impact of information technology. (Date Lee Yee Cheong (Malaysia): Global Financing and Economic Impact on Science, Engineering and Technology Development and Engineering Education in the 21st century. European Journal of Engineering Education, vol. 24, Number 3, 1999, p. 221-231)

The quality of engineering education in its broad sense will be one of the most important issue of the higher education in all countries of the world.

According to Mr. W. J. Rourke (Australia) the future health and welfare of developing countries will be dependent upon the quality and availability of education among others of engineering education. I fully agree with his statement; to create a better world, we have to foster sustainable development, which idea

can be realized among others through a high quality education in engineering science and technology.

Mr. Yildiz and Mr. Kiper (Turkey) underline, that the national development strategies must be in harmony with the quality of the country's engineering education.

The recognition of engineering degrees is in close connection with the quality of engineering education. Academician Pál Michelberger and Mrs. Gabriella Homonnay (Hungary) discuss the methods, possibilities and significance of the recognition of degrees.

According to the opinion of Professor V. Hopp (Germany), all engineers who work in different specialised fields should have the same level of fundamental knowledge in engineering. This is one of the basic requirement of the quality of engineering education.

To promote the proper development of the higher education related policy is more than a challenge for us, it is an urgent necessity, according to the opinion of Dr. Gianfranco Cicognani (Italy).

Professor J. Kövesi, T. Szabó and G. Bóta (Hungary) are reporting about the management and organising the quality management system of engineering education.

Professor M. Heckle (Germany) is discussing in his article the positive experiences of their applied TQM System, which uses as its core-tool the evaluation of all lectures and processes by the MBA participants.

On the basis of Professor R. Petriková's (Czech Republic) article we may state, that to create a system of quality management must be based on well managed and continuously improving processes of "knowledge delivery".

From the article of Professor P. Michelberger (Hungary) we may learn, that the Hungarian Accreditation Committee become the member of the European Network for Quality Agencies, and a network for Central and Eastern European Quality Assurance Agencies has been established. This CEE Network fosters mutual understanding about the work of quality assurance agencies that face similar problems, as they operate in a similar geographical and political context.

According to the opinion of Professor M. Osborne (Australia) the public investment in maintaining our universities as centres for learning and scholarship is surely a reasonable aspiration.

Proper size of public investment into engineering education may contribute to the improvement of the quality of higher education.

The reason, why we choose this title of the 9. Number of IDEAS was to share with our distinguished readers the thoughts of worldwide known and acknowledged excellent experts about these most important topics of engineering education, at the end of 2002. Let me thank very much the most useful work and help in editing this number for the members of our Editorial Board for Prof. Miguel Angel Yadarola, Dr. David Reyes Guerra and Dr. Stefanos Ioakimidis further to the Past President of the Federation of Technical and Scientific Societies Professor Pál Michelberger and to the recently elected President of the FTSS, Dr. Tamás Zettner and also for the Secretary of our CET, for Mrs. Zsuzsanna Sárközi-Zágoni.

A Vessel for Engineering Education in the Developing World

William. J. Rourke— Special Adviser to the President WFEO
brourke@pcug.org.au

ABSTRACT: In 1999, the General Assembly of the World Federation of Engineering Organizations (WFEO), representing the world's national and international engineering organizations, unanimously endorsed a proposal to establish a Virtual Engineering Library for Sustainable Development. It was envisaged that virtual engineering libraries would be established on the Internet, and that material provided by them would be useful in supporting engineering education in schools, technical colleges, and universities. The Institution of Engineers, Australia and the Institution of Professional Engineers New Zealand, each agreed to lend support to the development of the Australasian Virtual Engineering Library (AVEL) seen as the prototype of the WFEO Virtual Library System. The world system envisaged has been named the Virtual Environment and Sustainable Systems Engineering Library (VESSEL).

The President of the World Bank and the Australian Foreign Minister recently agreed on a program of educational assistance to developing nations named the Virtual Colombo Plan. They agreed that US $ 750 million would be spent on its implementation over the next five years. It is considered that science, engineering and technology should be important elements of the information transferred. National and international engineering institutions have an important part to play in defining developing country needs and ensuring those needs are satisfied. The services of a VESSEL network, meeting the needs of its users, can make substantial contributions to this information transfer.

INTRODUCTION: The World Federation of Engineering Organisations (WFEO) was established at a meeting of national and international engineering organisations organized by UNESCO in March 1968. Its aims were to work together on the qualification and development of professional engineers, and to promote a world wide system of information dissemination and retrieval in the engineering field. The Second General Assembly held in Paris in 1969 decided to set up standing committees to deal with Education and Training, Engineering Information, and Environmental Engineering.

In 1985 the WFEO published a Code of Environmental Ethics that provided guidance to the world-wide engineering profession and encouraged many national engineering institutions to modify their own

rules relating to the environmental responsibilities of their members. At its meeting in Arusha, Tanzania in September, 1991 the WFEO adopted policies relating to sustainable development which were submitted to the UNCED Conference on Sustainable Development in June 1992 and used as inputs into the drafting of Agenda 21. The Arusha Declaration proposed the establishment of Regional Development Centres to help educate engineers in developing countries, and that regional networks be examined to assist technology transfer in the most effective way.

In 1992 the Federation of Engineering Institutions in South-East Asia (FEISEAP) initiated studies into the development of a regional network for this purpose . A report "Creating Our Common Future" was published in 1994 and a study supported by the Australian EPA recommended that a regional network be established. A FEISEAP NET web-site was established at the SunSITE at the Australian National University in July 1996, and is still maintained as a WFEO / FEISEAP site at http://sunsite.anu.edu.au/feiseap

SunSITES are maintained around the world , and are generally attached to teaching institutions. They provide a convenient entry point for initiatives such as these.

It was decided in 1999 that the Hong Kong Institution of Engineers should take over the administration of the FEISEAP NET site which can now be found at http://www.hkie.org.hk/feiseap/sdnet/index.htm. Regional Centres have been established by UNESCO, such as the Virtual Centre for Environmental Technology in Osaka, Japan.

In 1999 at the World Science Congress in Budapest, an Agenda for Action was agreed. It included the words "The establishment of an international programme on internet-enabled science and vocational education and teaching, together with the conventional system, should be considered to address the limitations of educational infrastructure and to bring high quality science education to remote locations."

At the WFEO Assembly in Madrid in November 1999 it was decided that WFEO, in conjunction with UNESCO, and with the support of UNEP and UNDP, should establish a World Virtual Engineering Library for Sustainable Development.

Each National and International member of WFEO would be invited to contribute to it and to use it. It was appropriate that one of the lead speakers at the conference was Mohamed-el-Ashry, Chairman of the Global Environment Facility . His address was entitled "Engineering Leadership for the Global Environment" and emphasised the need for country-driven effort to integrate considerations of environment and development in pursuit of sustainable development.

It was agreed that the principal emphasis of the Virtual Library would be to provide resources to assist in education at senior levels in schools, and at technical colleges and universities. It has been decided that the library network will be called the Virtual Environment and Sustainable Systems Engineering Library, and that the acronym VESSEL will be used to denote the network. It is believed VESSEL will operate to develop complementarity between participating virtual engineering libraries.

VIRTUAL ENGINEERING LIBRARIES

Virtual engineering libraries are those that can be accessed by the Internet, and range from those that will provide titles or abstracts only, to those that provide access and down-loads for full text papers or lecture notes. Virtual libraries will generally allow the would-be reader to access the paper by clicking on the title of interest. This action will allow the reader access within the library site, or by direct connection to some other site that holds the paper. Many virtual libraries provide access to titles or abstracts or links to other sites, but have little or no full text access.

A number of virtual engineering libraries have been established. Engineering Informa-

tion offers access on a fee basis to Compendex, the world's leading engineering abstracts data base. EEVL, the Edinburgh Engineering Virtual Library, commenced operation in 1996, and provides a free gateway to engineering information on the Internet. EEVL has close links to UK based professional engineering institutions and had substantial initial funding by the UK Higher Education Council. It is available at http//www.eevl.ac.uk/ and contains links to other Virtual Library services including the learning and Teaching Support Network. EELS, the Engineering Electronic Library of Sweden, can be accessed at http://eels.lub.lu.se/

None of these libraries at this time are catering particularly for the engineering education market at the undergraduate or technical college or secondary school level, and are not specifically focused on sustainable development.

AVEL and its Virtual Services.

The prototype World Virtual Engineering Library is epitomised by AVEL, the Australasian Virtual Engineering Library providing a world-wide service from its location at the University of Queensland. Its website is http://avel.edu.au It should be noted that the range of engineering material provided by AVEL is not solely related to environmental and sustainable systems matters. There is however substantial coverage in this field. It is expected to grow and become pervasive.

AVEL is supported by a number of Australian and New Zealand Universities, and by the Institution of Engineers, Australia and the Institution of Professional Engineers, New Zealand. It is hoped that an increasing number of useful papers and lecture notes and study guides will be provided and made accessible to readers world wide. It is hoped to build up virtual library resources that meet the needs of lecturers in the developing countries, and will help them by providing appropriate material to use interactively with their students.

The Institution of Engineers, Australia is currently considering its publications policy but has indicated it will provide AVEL with abstracts of all its transactions and conference papers, and will give consideration to requests for full text copies of any transactions in excess of four years since publication and conference papers in excess of two years since publication.

Discussions are currently being initiated with a number of developing country members of the Federation of Engineering Institutions in South-East Asia and the Pacific, asking them to identify their priority needs for support, and asking them to establish links with World Bank and national and international aid agencies, so that appropriate aid programs can be developed. It would seem likely that some of these programs should be at the secondary school level, and would need to be available in the local language.

The World Bank Global Development Learning Network

The Global Development Learning Network of the World Bank provides Distant Learning Centres in many countries and a network for communication with each other. It appears to be particularly useful for communication between experts in different countries. It does not appear to be a low cost means of communicating to those in need of education.

THE VIRTUAL COLOMBO PLAN

In 1950 member countries of the British Commonwealth met in Colombo and agreed on a plan for educational and economic development of South-East Asia. Australia was a substantial contributor and many students from South -East Asia travelled to Australia for their University studies. It was generally agreed to be a highly successful aid programme, with many graduates destined to occupy senior positions in industry and in government.

In late 2000, World Bank President James Wolfensohn and Australian Foreign Minister

Alexander Downer agreed that an Australian-World Bank team would work to consider steps that might be taken to establish a Virtual Colombo Plan that would help overcome the digital divide, and use new technologies to improve access to education and knowledge in the developing countries. Their study noted that recent history indicated increasing use of new technologies. It was agreed that education priorities would vary, but that there was a common need to enhance the capacity of policy-makers in the education sector, of teachers and lecturers to assist in improving education quality, and of administrators to strengthen the systems used. There are seen to be great needs for more access to knowledge, with agriculture and environmental issues being of high priority.

It has been decided that Australia will provide US$100 million and the World Bank will provide $650 million to the Plan over the next five years. It is intended that the delivery will be arranged in three stages. Stage 1 started in 2001/2002. It is directed at improvement of basic education to improve the training of teachers and strengthening of policies to introduce information and communication technologies to schools. Stage 2 will start in 2002 and will focus on delivery of knowledge to meet the needs of development.

The third stage, due to start in 2003, will be to improve the quality of higher education, with some particular emphasis on technical training. All of these programs will be tailored to respond to the needs of the recipient country.

It is considered that the engineering institutions of the developing countries should work with their governments to help define the priority needs for Stage 3, and encourage their governments to accord engineering studies a proper place. There needs to be careful consideration of the preferred target audience, including particularly whether it is best to direct the material at students, or at their lecturers. Discussions with lecturers at Papua New Guinea's University of Technology indicate their priority need is support to their own programs by provision of lecture material, by tutorials and progress tests, and assistance with examination papers. This may well be generally preferred.

Australia is currently the only national supplier of aid under the Virtual Colombo Plan but it is to be expected that, if the Virtual Colombo Plan has good prospects of encouraging a substantial improvement in education in the developing countries, that other developed countries in the region will join the Plan, as they did for the Colombo Plan of fifty years ago. This would greatly assist in increasing the services provided.

It is to be hoped that, by the end of the first five years of the Virtual Colombo Plan, a substantial number of aid programs will be running successfully in support of local lecturers and local students in the less developed countries.

There is likely to be a need to establish appropriate standards for local engineering needs, and standards for regional practice such as those standards required of the APEC engineer. Some materials would need to be in local languages, and others in the languages used by the developed countries. It would seem likely that Virtual Libraries will need to operate in English, French and Spanish and possibly Mandarin Chinese.

It is believed that the large number of regional SUNSITES around the world may well be prepared to provide opportunities to host Virtual Libraries as in Australia.

Most of the SunSITES are at universities or other key educational and research institutions around the world. Sites are listed at:
http://www.sun.com.au/worldwide

VIRTUAL UNIVERSITY DEVELOPMENT

The World Bank has also identified the need to provide additional support to the availability and quality of courses at the African Virtual University . This University, launched in 1997 by the World Bank, allows

students and researchers at 31 partner institutions in 17 African nations, access to a virtual academic library, and to satellite transmitted lectures from professors in other countries. Australia has become a contributor and the University of Southern Queensland has provided a course in business management.

There is a recent initiative to establish an ASEAN Virtual University for Science and Technology (VUST). The project has been jointly initiated by ASEAN and UNESCO with UNESCO participation from its Jakarta office. The project aims to produce IT based engineering course material, and to facilitate resource sharing amongst the ASEAN universities. It is intended that the activities of VUST will expand to distance learning, virtual library networks, virtual conferences and virtual R & D. The working group involved in its development includes the Federation of Engineering Institutions in South-East Asia and the Pacific (FEISEAP), the Association for Engineering Education in South-East Asia and the Pacific (AEESEAP), the Asian Institute of Technology, the University of the Philippines, the University of Malaya, Chulalongkorn University and the Thailand Graduate Institute of Science and Technology. It has been agreed that a demonstration web-site for VUST will be established by the University of the Philippines. Eight leading engineering universities in the Mekong Region have recently launched a joint network.

There would seem to be a synergy between the VUST initiative, and VESSEL, and the Virtual Colombo Plan, that should be explored to provide mutual support.

THE WAY AHEAD FOR VESSEL

Payload for VESSEL: Library Resources

There is clearly a need to define those resources that should be accorded priority . The detailed definitions should be a matter of discussion between the developing country recipients and the developed country suppliers, with special weight given to the needs of the developing countries. There are however some general characteristics that can help identify suitability.

First and foremost the papers placed in the virtual library should be of high quality. They should often be prepared as a sequence of lessons with each paper of modest length. There will in time be a call for review papers showing recent developments in technology, or analyses of industry or agricultural policies, but for the most part the resources are likely to be required to be specially written to meet the needs of teachers and students in the developing countries.

It seems probable that there should be some emphasis on new approaches to agriculture that make the best and most appropriate use of new crops and new techniques. There could well be a need to provide advice on the provision and quality of drinking water, and on the generation and distribution of power in rural areas. It is suggested it could be useful if national engineering organizations could work with their governments and help define these needs.

Obstacles to Virtual Library Utilisation

There are a number of prospective obstacles to be overcome in regard to Virtual Library development and utilisation. One relates to the copyright of published papers, and to the willingness of holders of intellectual property rights to allow their work to be freely accessed. It is thought that some degree of altruism will exist in the developed countries, that will encourage the owners of intellectual property rights to allow free access at a certain time after publication. It should be possible to get widespread agreement to publish freely after say 24 months. Some IP owners might agree to publish after 6 or 12 months. Some producers of lecture notes might be prepared to allow free access to papers if a one-time fee is paid to allow unrestricted on line access. There may be some lecturers who are prepared to allow

access to lecture notes without any fee. The Massachusetts Institute of Technology has stated it will provide access to virtual material on all its courses within the next few years.

At present many of those who publish papers use a © for copyright symbol. As an advocate of virtual libraries, and particularly as a supporter of VESSEL, I have asked the World Engineering Congress to share their copyright in this paper with VESSEL, allowing each of these entities freedom to publish. I commend to other authors, to conference organisers, and publishers of transactions, that they consider arrangements that would allow copyright to be extended to virtual libraries at some appropriate time after initial publication. I believe that special consideration should be given by authors and publishers to papers that can assist in the sustainable development of developing countries, and in assisting in the education of their engineering and technical students.

If access to the services of a virtual engineering library is seen to be a significant factor in increasing productivity in less-developed nations, there may well be those who are willing to pay reasonable amounts to IP owners, and facilitate the distribution of their works.

A further obstacle is the understandable reluctance of engineering institutions and of universities to take any action that might diminish their revenues. The engineering institutions can argue that providing non-member access to their publications will weaken the incentives to become a fee-paying member.

The universities can argue that providing developing country access to engineering lecture material can weaken the incentive to become a fee-paying student. However these perceptions of lost opportunities often seem to be overstated. The risks to revenues can be reduced by a focus on those who could not otherwise afford the costs, and the advantages of institution membership can be maintained by delays in release of current publications as suggested above.

It is my belief that engineering institutions and universities in the more developed countries should have some degree of altruism in their relationship to developing countries, and their readiness to support their future development. There is mutual benefit to both parties in securing a high standard of engineering practice in the developing countries.

The Move to Open Access

There are currently several developments relating to open access to scholarly papers on the internet. The British Government recently established a Commission on Intellectual Property Rights (CIPR) that has a website at http://www.iprcomission.org/ A principal task of the CIPR is to see how national IPR regimes could best be designed to benefit developing countries. The web site provides a number of study papers including a "Study on Intellectual Property Rights, the Internet, and Copyright" by Alan Storey, lecturer in Intellectual Property at the University of Kent, that provides a range of arguments in support of improved access to those in developing countries. The CIPR is due to report to the Secretary of State for International Development in the northern spring of 2002.

Peter Suber at http://www.earlham.edu/~peter/fos/provides the Free Online Scholarship Newsletter with the aim of describing developments in the field of free online publishing, and of exploring how the Internet is changing scholarly research. An important recent development, in which Suber has played a leading role, is the Budapest Open Access Initiative described at http://www.soros.org/openaccess/read/shtml Philanthropist George Soros has agreed to support a network called the Open Society Institute. The Institute is committed to the introduction and development of self-archiving, whereby scholars can deposit their refereed journal articles in open archives accessible to all, and to the establishment of a new generation of open access journals that would charge no subscription or access fees.

Such journals might be either newly established for this purpose, or might be existing journals adopting a new policy.

Open access is already being provided by the British Medical Journal at its site http://www.bmj. com/ that allows free access to the full text of nearly all the articles it publishes. It would seem particularly appropriate that journals relating to education, and engineering education, adopt this approach. To quote the Budapest Open Access Initiative "We invite governments, universities, libraries, journal editors, publishers, foundations, learned societies professional associations, and individual scholars who share our vision to join us in the task of removing the barriers to open access , and building a future in which research and education in every part of the world are that much more free to flourish."

Charting A Course for VESSEL

The way forward for VESSEL almost certainly requires action to clear the channels of obstacles, or to find a way of steering around them. The following are considered to be some necessary steps.

Those involved in science, engineering and technology activities in the developed countries should, through their national engineering institutions, encourage their governments and their universities and technical colleges and their schools, to develop courses for delivery of the basic understanding required by students in the developing countries . Those in the developing countries need to encourage their engineering institutions to support these activities. We must mobilise engineers in both developed and developing countries to support this action, and represent these needs to governments.

The engineering institutions in the developing countries should set up groups charged with the responsibility of pursuing these aims from the viewpoint of the recipients. The national and international members of WFEO should provide advice as to how these aims could be best achieved. One of their main tasks would be to define the courses that should be provided at the secondary school level, and by technical colleges, and by universities.

The engineering institutions in developed countries should set up groups charged with the responsibility of establishing or establishing links with a virtual engineering library, and work to fulfil the needs articulated by the developing countries. The international members of WFEO should work particularly to encourage the production of virtual library resources in several languages, noting that it should be possible to translate key documents to make their content available to a broader audience.

WFEO members should encourage the development of, and support for, Virtual Engineering Libraries by UNESCO, UNEP and the World Bank.

A SUCCESSFUL PASSAGE

The test of success for a number of VESSELs in a variety of languages will be the long term return from the educational investment. Those who have read "From Third World to First" by Lee Kuan Yew will note the emphasis given to support and strengthening of the education system in Singapore, and the substantial long term returns from these policies.

Later this year there will be a World Summit on Sustainable Development in Johannesburg. It will set out aspirations for a better world. It seems certain that the summit will give particular emphasis to the development needs of the less developed nations. It is expected that there will be recognition that the pathways to achieve such outcomes will be highly dependent on education, and particularly on education that emphasises science, engineering and technology. The Virtual Colombo Plan provides an expectation that the developed nations will support aid programmes that will enable the less devel-

oped countries to play an increasing role in sustainable national development. It is suggested that the time is right for VESSEL to get under way. It is to be hoped that it will be a forerunner of a large fleet of Virtual Libraries that will greatly assist the Virtual Colombo Plan and each of the developing nations it sets out to serve.

THE CURRENT STATUS OF VESSEL

The present intention is to provide that AVEL be an inaugural element of the VESSEL network. We also have the WFEO-/FEISEAP development site at the ANU SunSITE at http://sunsite.anu.edu.au/ /feiseap. Other VESSEL sites will be progressively established, and all national and international engineering organisations should make resources available to them. Individuals supporting the aims of VESSEL should assign their copyright to the VESSEL network.

CONCLUSION

The future health and welfare of developing countries will be largely dependent upon the quality and availability of education, including particularly education in science, engineering and technology . VESSEL will provide support to that education and will foster sustainable development, so providing a better future for us all.

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Engeneering Education and Training Problems in less Developed Countries

INFORMATION-FORMATION-DEFORMATION

Dursun YILDIZ CE—Vice President of Union of Chambers of Engineers & Architects of Turkey
Mahmut KIPER Metallurgical Eng. Specialist. Turkish Scientific & Technical Investigation Organisation

INTRODUCTION: The rapid technological development of our age is altering the profile of engineering in the 21st century. Engineers' education, their professional and social responsibilities and their indispensible position in production have been affected at the same rate by this change and will continue being affected in the future. Therefore, evaluations related with the changing profile of engineers should include education, as well. However, the basic function expected from engineers in countries caught in the dilemma of underdevelopment and instability must be analysed and evaluated in terms of the extent of it, coinciding with the change in the profile and function of engineering in the evolution towards information society.

This process should include the analysis of not only the quality of engineering education and engineering services, but also the level of use of engineering functions and expectations from engineers. Even if we assume that engineers are trained to generate technology, observe technological and scientific developments, their working conditions in the production process and the expectations from them should be the topic of this analysis too.

The speed of technological development in the 21st century will rapidly leave developing countries behind as long as they fail to produce new policies in this field. These countries, besides widening the extent of their modern engineering education, have to develop a technological foresight for industrialisation, research and development for producing technologies, and policies for university-industry collaboration. For this reason, they have to implement policies that will not only bring up better equipped, experienced and conscious engineers and architects, but will also bring them to productive positions in the social and technical division of labor that is suitable for their professional education.

Science - Technology - Welfare

The basic condition for benefiting from the opportunities created by scientific inventions and technological developments for economic progress and social prosperity, is transforming the new scientific information to innovative products, processes, organisations, markets and services. In order to raise the level of social welfare in our global environ-

ment, it is necessary to possess industrial superiority and this requires a top level technological competence. The precondition for a top level technological competence is comprehensive Research and Development work encompassing information basis and university-industry cooperation.

It has been recognised that scientific based information is the propulsive force of technological innovations which have been flourishing at a very high rate since the end of 18th century. It would be self-explanatory to consider the following data to evaluate the impact of scientific information on future developments; throughout the history of mankind, the information produced until 1760 has doubled between 1760-1950 and has been doubling presently every 2-3 years.

The claim that 70% of the technologies, that will be used at the beginning of the 21st century, are still unknown despite the assumption that 70% of the existing working population will continue working is an estimation that requires careful consideration.

Technological variations, which is the basic factor determining the boundary between developed and developing countries, emerge in the technology transfer systems.

In the developed countries, this system appears as the basic science, the transfer of information from basic and applied research and technology development agencies to national industry, in other words horizontal technology transfer; whereas technology transfer in developing countries can be observed as vertical technology transfer in the form of transfer of information and production techniques from developed countries.

In other words, the depth of technology is greater in developed countries when compared with developing countries. It is also clear that, the value added by the increase in technology depth exhibits an accelerating increment. At the same time, there is a direct relationship between technological and scientifically based information and this is the essence that makes horizontal technology transfer mechanisms meaningful in developed countries.

The significant differences determining the boundary between development and underdevelopment in these two systems are:
a) Added Value that is Created / Difference in Cost ratio
b) Possession of tacit kowledge in technology
c) Time

It is necessary to juxtapose the diagrams in Figures 1 and 2 with national technology maps and to know which interval the existing or supposedly claimed technologies correspond, in order to understand better the effects of these 3 components on the development process.

Social Assessment of Technology

A scientist, who has drawn a similarity between technology and automobiles, has stated that "it is like a vechicle but it does not have a road map, rear view mirrors or headlights".

Particularly, parallel to the rapid technological developments, enabled by the application of experimental science to technology in the last 300 years, the social assessment of technology has become an important concept not only on the agenda of developing countries, which are affected more by the problems generated through technology but also in developed countries.

The science and technology relationship, which used to be based on science, influenced by science and used to support one another, has been developing with greater emphasis on technology, particularly in the last 25 years. The equilibrium that has been upset in favor of technology representing the benefits of its owner, instead of science, which represents universal and public interest, requires the social assessment of technology or its execution by others in societies unable to carry out this assessment themselves.

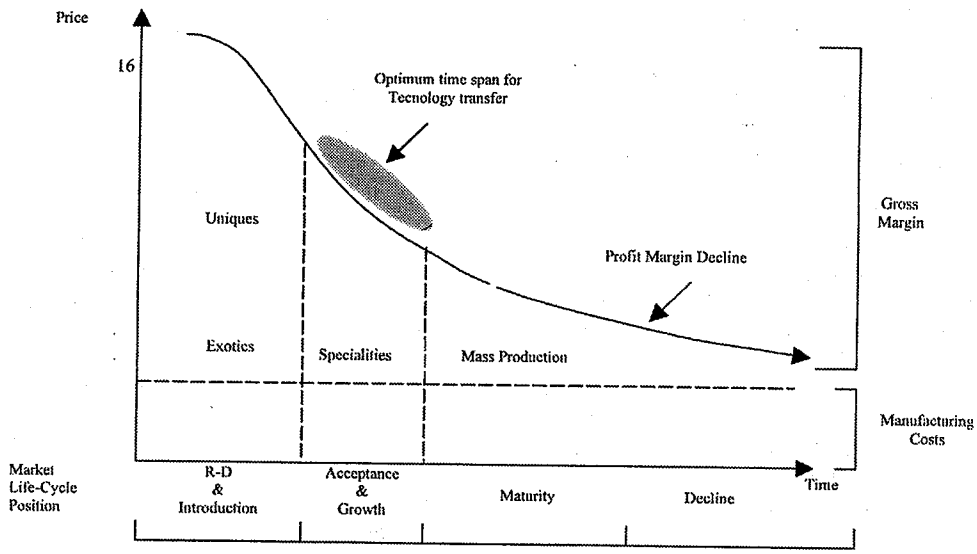

Figure 1. The Technology Applications Spectrum (TAS)
Source: Hruby.F.Michael, Technoleverage, AMACOM.

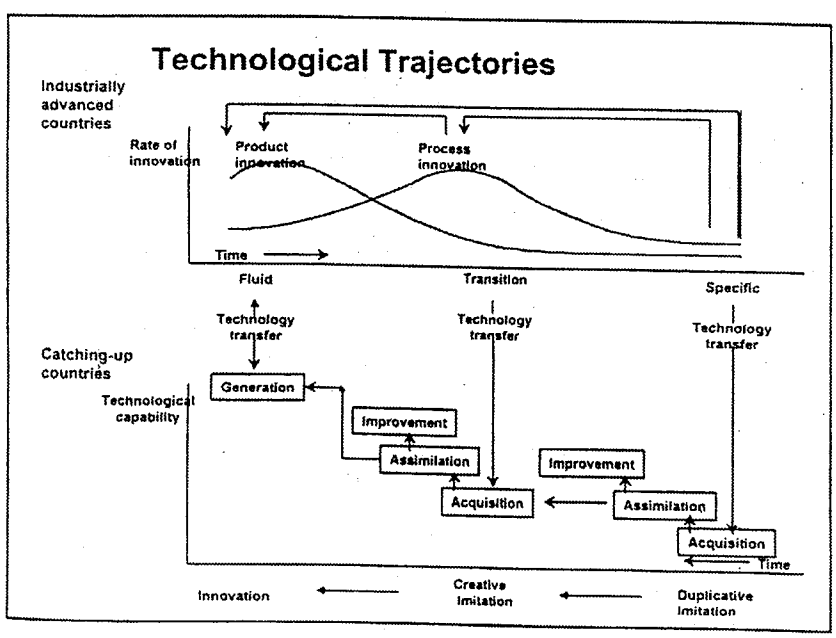

Figure 2. Technological Trajectories
Source: Kim Linsu, Prof., Korea's Experince, Jan. 2000

Which Knowledge?

The high rate of information growth, together with the striking developments in information and telecommunication technologies, facilitate the attainment of 'knowledge'. However, one should not make the mistake that it becomes easier to reach any kind of information. It becomes easier to attain 'information, ie. unprocessed knowledge' or 'codified knowledge' [1], but it is even more difficult than before to reach 'tacit knowledge' [2].

All this process, besides the source and evaluation of knowledge, necessitate the analysis of some of the concepts mentioned above, in the field of engineering. However, it is essential not to confuse knowledge with information. These two concepts are claimed to be the two different levels of the process that reach the formation of the mind. This process is described as data - unprocessed knowledge/information - knowledge - mind/wisdom.

Presently, the education systems are based on the approach of learning how to learn instead of learning, reading and writing knowledge instead of being solely literate. It is necessary for an engineer,who has learned to learn and has overcome the difficulties of reaching data, to transform this information into knowledge and wisdom, and the basic condition for using this process more efficiently is that he/she should have a formation. In other words, the ability of using information, that is unprocessed knowledge, by processing it to find the most appropriate solution increases directly proportional to the level of formation that has been acquired.

Three Concepts in Engineering Information-Formation-Deformation

An engineer may criticize and try to change the things presented to him as knowledge during his career. Most of the time, he may also have to make a choice among the variety of solutions provided by technological developments. Therefore, it is essential that an engineer should have a scientific and social engineering formation, with the ability of independent thinking and questioning in order to make the correct choice and best evaluation,including the social assessment of technology, from the standpoint of science and society.

On the other hand, a person may have graduated with the formation described above, particularly in developing countries there are many issues awaiting the engineer in the field of practice. In developing countries, there are problems arising from the incongruity of the engineering education and the existing economic relations, and the discrepancy between the model for education and the national model conforming to the organisation of social and technical division of labor. As a result, a large portion of the knowledge acquired in professional education is left useless within the scope of economic relations. This results in the engineer not being able to obtain a social position suitable for his/her professional education or formation.

In other words, if a balanced relationship has not been established between education and production, in the social structure - industrialization, unemployment, dissatisfaction at work- it is not possible for the educated individual to adopt a creative and responsible identity by taking a position in the society and getting professional satisfaction from his work. Thus begins the process of alienation of the individual to himself and to some basic values.

When the engineer is condemned to an unchanging lifestyle caught between dogmas and rigid rules, instead of being able to lead a life aimed at pursuing technology, producing and finding solutions; the process of deformation will begin.

Conclusions

Besides educating engineers in developing countries to be better equipped, it is of utmost importance and priority to adopt the

necessary policies enabling them to acquire a productive position within the social and technical division of labor that is compatable with their professional education. The consequences of not putting these policies into practice is either the brain drain of engineers or the commitment of a large portion of engineers to professional deformation.

Therefore, the evaluation of engineering education and practice in developing countries should be taken into consideration with the above stated perspective and;

– Whether the problem experienced by majority of engineers in developing countries concerning the formation of engineers results solely from the inadequacy of university education should be questioned.
– Within the existing social division of labor and applied policies, the expectations from an engineer who is qualified with the contemporary engineering formation should be studied.
– Taking into consideration that education is oriented to production, the significance of diminishing factors influencing the deformation of engineers with a contemporary engineering formation should be evaluated.
– The rapid developments enjoyed in technology affect the process of providing formation in engineering, and the fact that it is a process which accelerates deformation when neglected should be considered carefully.
– The relationship between directing contemporary engineering formation to developing the nation without causing deformation, and the development strategies applied on the basis of production economy, university industry collaboratio, and science and technology policies should be analysed.

Raising the quality of engineering education should be studied within the framework of planning and technological foresight approaches directed at national development strategies of countries, by adopting a unitarian approach.

If an engineer, who is capable of processing the rapidly increasing unprocessed information, is cut off from production and falls behind the rate of change of information, then deformation will increase and it will not be possible for him/her to catch up after a certain period of time.

As a result, it is necessary to analyse the benefits expected from contemporary engineering formation in the process of information -formation -deformation with a holistic approach.

[1] Codified knowledge: is the knowledge carried to a context where it can be transmitted, stored and carried using some codes (e.g. language). In other words, it is the knowledge which is organised according to a system, transformed into a paper, becoming therefore available to everyone.

[2] Tacit knowledge: is the knowledge which is not prepared according to a system or made ready for use. It is the knowledge belonging to an expert or the kind known as 'know-how'.

Recognition of Degrees Methods, Possibilities and Significance

Pál Michelberger—President, Hungarian Accreditation Committee
Gabriella Homonnay(†)—Secretary General Hungarian Accreditation Committee

1. INTRODUCTION: *The Significance of the Issue in Central Europe*

The present analysis narrows the otherwise incredibly large topic of the recognition of degrees through two considerations. First, the issue is going to be discussed from the perspective of a small Central European country, namely that of Hungary. Second, one particular scientific discipline, i.e. technical science, has been selected from the vast list of different scientific disciplines. The reason for these limitations is twofold: the authors' commitments on the one hand, and that the limitations provide a good illustration for the substantiation of their thesis on the other.

The geographical location, the historical turmoil in much of the past one and a half centuries, together with the present geopolitical and economical situation necessitate urgent changes in Hungary. In the past, within the large and uniform market of the Austro-Hungarian Monarchy, the exchange of commodities, the spread of technical innovations and the mobility of the work force were very dynamic. The boom came to an end in the 1920`s, as one of the sad results of the Peace Treaty of Trianon. The flow of capital was now impeded by the many different customs systems, and the incompatibility of the railways and other infrastructure. The international quality of higher education and the free mobility of the work force disappeared later because of the totalitarian system.

One has to conclude from these historical experiences that it is necessary to break out from the psychosis of the "small country syndrome", and to overcome linguistic isolation. To achieve these aims the first thing to do is to understand the methodology of the recognition of degrees.

2. Fundamental Systems of Recognition

As a result of the research into higher education, the question is increasingly voiced that it differs from one field of knowledge to the next whether college and university level-i.e. Bachelor's and Master's level-education should exist side by side or the latter build on the former.

The necessity for making such distinctions is best illustrated by looking at three major fields of study.

– First, in technical and economic fields, the bachelor's degree is useful for a wide range of occupations. As a result, in some countries one can, with some work experience and under certain conditions, obtain a high position even with a bachelor's degree.

– Second, and in contrast with the previous fields, the situation is completely different for medicine and experimental laborato-

ries where the occupations and the positions are clearly different for those who have a BS degree and for those who have an MS degree.

– Third, a further field covers disciplines in the humanities such as philosophy where there is no point in educating at the BA level.

In this paper, we will concentrate on the first field, and here the recognition of degrees or studies plays a significant role. The different types of recognition can be classified into three categories: "Official", "Professional" and "Academic" Recognition. Let us consider the "Official" Recognition first [1].

2.1. "Official" Recognition

An "Official" Recognition of degrees means that countries recognize degrees that have been obtained in a country with which a recognition agreement has been concluded. The recognition can be bilateral or multilateral according to the contract. In Central Europe during the Soviet dominance and the dictatorship within the territories of the Comecon or CMEA (Council for Mutual Economic Assistance), the recognition of degrees was dictated by the Party. In other words recognition was based upon political decisions.

Today equivalence is the issue of exhaustive investigations and bilateral or multilateral agreements preceded by thoroughgoing preparatory work. The latest bilateral agreement in Hungary, the one between Hungary and the Slovak Republic, serves as a good example to demonstrate how much energy is invested into the procedure leading to an agreement of this sort.

The preparation of the agreement needed a rather long and exhaustive period of discussion before the views and interests were harmonized. The period leading to the agreement consists of two parts. The discussions started in 1989 between Hungary and the Czech-Slovak Republic without definitive aims. This first period came to an end in 1997 when the first proposal for the agreement was issued. Experts and officials of the ministries of both Hungary and the Slovakian Republic started to analyze the proposal. The first official meeting of the committees of the countries took place two years later in 1999. The views could not be harmonized there, so there was a further year needed to arrive at a contract that could be signed by both parties. This took place in February 2000. During the three years between 1997 and 2000 there were six drafts exchanged between the parties and each draft was preceded by several draft versions of the text.

The relationship between equivalence and national accreditation is a question of future. Theoretically, a convergence between equivalence and national accreditation, in line with the principles of the Bologna Declaration convened on the 19th of June 1999 [2], is expected. The way they will be related, however, is not yet clear. Still, three-not necessarily mutually exclusive-courses seem to be emerging.

– One is that an accreditation committee recognizes whatever another has accredited.

– Another is that accredited institutions form associations and recognize the degrees issued in the partner institutions.

– A third possibility is that accredited programs form associations and recognize the degrees issued in the partner programs.

2.2. "Professional" Recognition

Professional Recognition is the duty and right of civil organizations, such as Chambers, Societies, Associations and Federations. In numerous countries it is exclusively Professional Recognition that allows one to use the engineer designation. So in these countries Official Recognition is not enough, because one may have a degree that is officially recognized, without being allowed to work as an engineer. This means that the degree is a necessary but not a sufficient requirement. Take as an example the Fédération Européenne d'Associations Nationales d'Ingénieurs the European Federation of National Engineering Associations (FEANI) [3].

The FEANI issues the Euro-Engineer designation after a thorough investigation about the candidate. The investigation is thorough because it assesses the individual's professional career meticulously and conducts the assessment at two levels: first at a national, and then at an international level.

The qualification of the professional career consists of two major elements. First the candidate's education is assessed, which is closely linked to accreditation. Education, however, is not enough for the qualification. Professional experience is also a constituent element of the investigation.

"After a secondary education at a high level validated by one or more official certificates, normally awarded at about the age of 18 years, a minimum total period of seven years' formation-education, training and experience-is required by FEANI for the EUR ING designation." The investigation of the formation period focuses on two major issues: engineering education and valid professional experience.

The criteria for an acceptable engineering education include reference to the number of years spent at an approved institution and to the curriculum. The candidate must have spent a minimum of three years at a university or other recognized body at university level admitted by FEANI. "During these years he had to be provided a thorough knowledge of the principles of engineering, based on mathematics, physics and computer science appropriate to his or her discipline. Any engineer listed in the FEANI Register is guaranteed to have had such an education."

Appropriate engineering education is not sufficient in itself though. The candidate is supposed to have a minimum of two years of valid professional experience. Professional experience is not only a formal requirement, meaning that one must have spent two years in the profession, but it must assure that the candidate has reached a high standard in his profession. This way the investigation of the professional experience includes the following areas. The candidate has to prove that he has "solved problems requiring the application of engineering science in the fields such as research, development, design, production, construction, installation, maintenance, engineering sales and marketing." The candidate has also to demonstrate that he or she has had "success in management or guiding of technical staff or the financial, economical, statutory or legal aspects of engineering tasks, or in solving industrial and/or environmental problems." Naturally, the individual's mastery of a foreign language is also part of the investigation.

To guarantee high standards, FEANI applies a system of evaluation of an individual consisting of two levels: a national and an international level. The National Monitoring Committee examines the application first. After approval the National Monitoring Committee submits the application to the European Monitoring Committee (EMC). Finally, it is the latter Committee that awards the designation in accord with the criteria that have been approved by the FEANI General Assembly.

In contrast with "Official" Recognition, "Professional" Recognition thus concentrates on the individual's mastery of certain skills that are necessary for the profession. As discussed above, the "Official" type of Recognition means an agreement between countries without specific reference to the individuals' performance. The "Professional" type of recognition, on the other hand, focuses on the individual's professional achievements, although it does take into account the quality of the institutions responsible for the education of the individual.

2.3. "Academic" Recognition

A third type of Recognition, neither on the national nor the individual level, concentrates on institutions that are responsible for the professional formation of the individual. Universities of two or more countries recognize each other's degrees, or, alternately, issue a double degree in accordance with mutual agreements. Degrees or parts of studies are recognized as equivalent based on the professors' individual experiences, on the curricula, and numerous other factors. This type of recognition serves professor or student mobility for a short term, say one or two semesters, and consequently effects curriculum development.

An example for Academic Recognition is the Conference of European Schools for Advanced Engineering Education and Research (CESAER) [4]. CESAER is an association of

leading European universities engaged in advanced engineering education and research and dedicated to research-lead teaching. It was established in 1990 and now has a membership of about fifty universities in Western and Central European countries.

According to Article 2a of the Statutes of CESAER, the Conference aims at developing cross-European and international higher engineering education at four levels. These levels include student mobility, the diversity of engineering cultures, recognition of degrees, and cooperation of educational institutions. The Conference thus encourages "the training of engineers with broader educational experience, including linguistic abilities, developed by attendance at two or more leading engineering institutions in Europe". It also deems important and consequently maintains "the advantageous diversity and the standards of the highest levels of engineering education in Europe". The diversity of the educational institutions in itself would hinder the mobility of engineers with university degrees, so the Conference also takes measures to "secure international validation and acceptance of the qualifications of university educated engineers". A fourth means to raise the standard of education is to encourage the exchange of information between the leading educational institutions themselves. As a consequence the Conference promotes "further collaboration in engineering education, research and development between leading European universities".

The realization of these objectives depends almost exclusively on the meaning of the phrase "leading university". To define it, CESAER has worked out some criteria that set standards for the potential members of the association. Member institutions must run active research and education programs in a wide variety of engineering disciplines. According to Article 3a of the Statutes of the Conference "potential members of the Conference are European Institutions which have a legal status and which meet all following three criteria". First and foremost the conference believes that the high standard of education is founded upon the research carried out at the institution. Thus the potential member is supposed to "provide high-level scientific engineering education-as full time teaching-based on internationally recognized research carried out jointly by the teaching staff, the students, doctoral and post-doctoral researchers in the same geographic location". The high standard of instruction cannot, however, be founded solely upon the high standards of research, because the quality of the appropriation is limited by the abilities of the students. So the Conference wants its potential members to "use selective admission criteria conforming with legal provisions and/or national practices". The high standard of engineering education is also corroborated through its interaction with industry: the educational institution cannot stay within the walls of academic activity, but has to promote the social application of what has been taught there. As a consequence the potential member is supposed to "have a firmly established tradition of relations with industry in the fields of education and research".

Beyond these criteria the Conference further limits the meaning of the phrase "leading university" with reference to the potential member's position in the national and international market of universities. According to the expectations of the Conference the potential member should play a leading role in their own country and in several fields in the international scientific community. As a consequence, the potential member should be proposed to the Management Committee by at least 3 members, each of whom belongs to a different country and one of whom normally belongs to the country of the potential member. The Management Committee acts as the Selection Committee, examining the proposal and then sends its report to the Board of CESAER for the final decision. The examination of the internal qualities together with the position of the potential member institution in the national and international market at different institutional levels of CESAER guarantee the high standards of education of engineers at a European level. Both "Professional" and "Academic" Recognition have two major advantages compared to the "Official" one. The first advantage lies in

their laying emphasis on the mastery of at least one foreign language. This way both types of recognition foster education on a higher and more international level. The other advantage of "Professional" and "Academic" Recognition concerns a larger issue. Both require deeper and more substantial knowledge than what a simple accreditation can provide, because they presuppose professional and personal relationships as well. Within the framework of "Official" Recognition one does not have to have professional and personal relationships with engineers from the target country. Thus, the "Professional" and the "Academic" Recognition foster the international quality of a profession.

Nevertheless at one point the "Official" and "Professional" ways of recognition seem more advantageous than "Academic" Recognition. As a rule, "Academic" Recognition ignores the issue of employment. In contrast with this shortcoming of "Academic" Recognition, both the "Official" and "Professional" ways of recognition help graduated engineers find jobs.

3. Conclusion: Utilization of the Results of Recognition

What is the conclusion of our analysis of the different types of Recognition? More than anything else that the fruits of Recognition must be reaped in those small Central European countries where the psychological pressure of the "small country syndrome" must be done away with. Linguistic isolation can only be overcome by teaching foreign languages on a high level, by multilingual education both for foreign and Hungarian students and by inviting guest professors. In Hungary, beyond Hungarian one has to know English, French, German and Russian to some extent, and one has to master the vocabulary of one's profession in these languages if one wants to learn one's profession on a high level.

This appears as the path for the development of higher education to meet the objectives of the 21st century. It would be a great pleasure to listen to the international experts of the conference discussing the present issue from the perspectives of their own regions, and thus we could promote the improvement and development of the methods and systems of recognition.

We have started our discussion with the issue of equivalence, but we have to note there is more in "Professional" and especially in "Academic" Recognition than solely equivalence. What is far more than sheer equivalence is the personal relationship between the people of different nations.

[1] For a similar classification with different terminology consult Jack Levy. "International Recognition of Engineering Qualifications" esp. pp. 8-9 in Ideas for Better Education & Training for Engineer, No. 6, October 1999, ed. Prof. János Ginsztler, pp. 7-12.

[2] www.ntb.ch/SEFI/bolognadec.html

[3] All the ensuing information about FEANI is from their home-page: www.feani.org

[4] All the ensuing information about CESAER is from their home-page: www.cesaer.eu.org

Lecture delivered at INQAAHE Conference

Bangalore March 19-22, 2001

Topics for the standardization of international engineering education

Prof. Dr.-Ing. Vollrath Hopp—University Rostock, Germany

INTRODUCTION: The world's engineers should have the same level of knowledge but different specialisations.

The spectrum of talents in the countries all over the world is wide and varying. The scientific and technical innovation potential lies in the diversity of the talents, behaviour and characteristics of the people in the different countries. This will be the power in future. All nations have produced a lot of excellent and experienced engineers.

If we describe the profiles of the engineering qualifications in the different countries of the world, then it is useful to describe the tasks and problems which they have to solve.

Comparison of the training time, curricula, number of courses and disciplines do not give a realistic evaluation of the training quality and the standard of a degree.

The challenges, tasks and problems of the engineers in a country depend on the resources of raw materials, energy, climate and geological nature, geographical location, transport, infrastructure, materials and other factors. Engineers in mountainous regions require different knowledge and experience than engineers near the sea. In an area of earthquakes the houses must be built in a different manner than in a quiet area.

But all engineers who work in different specialised fields should have the same level of fundamental knowledge in engineering. The reputation of an engineer depends on his efficiency and experience during his occupation and not on his examination.

If we compare the training qualifications, then we must analyse the curricula, the teaching contents of the disciplines, the didactic methods, the professors and so on; that's very complex.

Fundamental knowledge

Education in fundamental knowledge consists of the basics of natural and engineering sciences. The study in mathematical-scientific fundamentals should include the basics of applied mathematics, information-technology, geometry, physics, chemistry, geology and microbiology. The main fields of technical fundamentals are the thermodynamics, energy and science of materials.

The technical fundamentals should be an introduction to the engineering disciplines which the student has decided to pursue, e.g. mechanical engineering, electrical engineering, construction, metallurgy, etc. In this connection, the basic knowledge requirement in the biosciences is an important novelty. The biosciences are concerned to make future

engineers sensitive to the laws of biological processes, selective optimalisation and evolutionary mechanisms and to show the relationships and similarities, as well as the differences to technical processes. One of the focal points of this period of mathematical-scientific and technical fundamentals must be to establish links between the individual basic subjects and to bring out the role of applied mathematics, geometry and information-technology. For general studies of this kind, highly experienced and reputable professors are needed. In general studies for degrees in engineering, the mathematical-scientific fundamentals and technical fundamentals should each take up 30 per cent of the normal duration of study.

Combination of practice and theory

Technical application is the link between theory and production on the one hand and the producer and user on the other. Interdisciplinary working and thinking are characteristics of jobs oriented to technical service and development. Engineering is a practical and application oriented profession. Therefore it is necessary that students should become familiar with different work-places for working with materials, manufacture, production or process-lines and planning.

The total time of practical courses should be 12 months, divided into one period of 6 months and serveral parts of the remaining 6 months. Before the start of his studies the student should have had practice in industry for about 6 months. During his course of study at university or college the student should spent 6 months doing different jobs. These 6, months may be absolved in several periods during the vacations between semesters.

Interdisciplinary thinking

It is a very important task and goal for the universities and colleges to train the students in interdisciplinary thinking. Training should unite specialist knowledge and general education to broaden one's horizons. Without general education, engineering training cannot take place; without basic technical knowledge, general education is incomplete. So, advanced training takes an another important dimension, one that should be considered when planning courses and curricula. We need engineers who can think in terms of international, technical, social and financial relationship in addition to possessing expert knowledge. Apart from their native language, they must be proficient in english. Social and economic topics should always relate to the profession or occupation and be explained as an integral part of the working world.

Engineering students must be prepared for and made sensitive to these demands during their university training. Everything which the student needs later on the job cannot be taught at school or university. The universities and colleges should train the self-teaching and thinking.

Specialization

The last phase of this course of study, which only makes up 20 per cent of the total, the student is to be given in-depth exposure to special fields, depending on his own interests. The dissertation is to be written during this phase. This gives the student the opportunity to demonstrate his own performance and thinking ability.

Degrees and titles

Training- and education-systems are involved in the cultural tradition of each nation. This component should be considered in the curricula and frameworks of programs of study. The national levels of the first, second and third cycle degrees must be comparable and conform to international standards. But the designation of the degrees may be differ, e.g. bachelor, master, Ph.D., Dipl.-Ing., Doctorate, Dr. They are a part of a long academic tradition of each country.

Expert knowledge and generalist qualifications

Not only specialists, who possess a great deal of detailed knowledge, but also technologists with generalist qualifications and an

overall view of the interdisciplinary basics are necessary in order to achieve an optimum degree of innovation between research and development and economic utilization. Not enough attention is paid to this aspect when formulating the goals of training and putting them into action.

One of the major future tasks the preparation of employees for management positions. The business world and public service administrations are both faced with this task to the same degree. The fact that managers must demonstrate above-average professional abilities ought to be a matter of course. They must be able to think in terms of contextual relationship.

An important requirement is the ability to lead others. In order to motivate the highest level of innovation and cooperation among specialists and working parties with far-reaching detailed technical and business knowledge, managers are needed who combine fast comprehension of problems, interdisciplinary and strategic thinking and human integration ability.

If the talent is there this type of management qualification can be activated and trained. It is important here to put aside the often encountered contradiction between specialists and generalists; both must grow to understand each other as complementary partners.

Qualification of engineers

While at university, young engineers are expected to have learned to analyze practical problems independently and to develop methods of solving them. Apart from sound knowledge in the field of study, integrity and self-confidence with regard to performance ability are expected. Technical and economic developments are never linear. Figuratively speaking, their paths are often marked by contradictions and detours. Overcoming these difficulties requires a great deal of technical-strategic and business-organizational skill, time and again, every individual must find his own path in order to remain innovative and creative. The responsibility that must be borne by a junior executive grows with increasing difficulty of the problems at hand.

A sense of responsibility, the ability to cope with stress, industriousness, reliability, the ability to handle failure, mediate conflicts and communication ability are qualities that are not determined by a person's intellect. And that's exactly the reason why they should be activated and promoted by the universities. For it is that they decisively determine the personal and professional reputation of a young professional. Students must learn to deal with disappointments and failure. They must also learn that every undesirable result also contains a positive message.

The Importance of Elite Education for the National Economies

Gianfranco Cicognani—Expert for Science and Technology of the Central European Initiative

Coming here last night I asked myself if, as an Italian, I were the right person to speak about the "elite engineering" related aspects. The reply was, at the same time, NO and YES.

No, from one side, because my country, Italy, even being a full member of the G8 Club, doesn't present an encouraging score at the Western Europe level when we consider a couple of parameters of an unique importance for classifying a modern and well developed society, namely the resources (in % of the national GNP) devoted to the scientific research and the number of people having an University degree out of the total population. Those data clearly show that the position of Italy is among the 3-4 countries which close the list, thus very far not only from the leading countries (the Scandinavian ones), but well below the positions of the big European countries (France, Germany and United Kingdom).

Yes, on the other side, because the need of promoting a proper development of the higher education related policy is more than a challenge for us it is an urgent necessity, should Italy want to keep its actual economic role in the international markets; thus the presentation of the efforts the country is producing in that field, despite the difficulties we are facing, could be of general interest.

Coming back to the task of this meeting, I want to start recalling an event, unexpected at least for its dimension, which occurred in Italy in the last months: the FIAT crisis. The roots of this crisis are different and diversified, but for sure one of the most important has to be recognised in the lack of investments on both new technologies and human capital suffered by FIAT in the last years. Those investments were less than 1/3 of those performed by the concurrence in Europe (in particular in France and Germany), in the US and in the Far East. As a result, in a situation of a basic difficulty for the auto market world-wide, the losses of FIAT were basically higher than those suffered by most of the other Groups, according to the logic that in circumstances of generalised crisis the higher costs (both economical and social) are paid by the weakest systems. All that happened despite the presence of a few excellent results obtained by the FIAT Group in a few selected sectors, the success of the Ferrari race-team being clear example of that. This circumstance is far to be surprising: in a global market competition a real competitive product needs that high-tech be properly diffused along all the main steps of the production process.

For sure the example of FIAT cannot be seen as an exception if we consider that our

industrial system is based more on the transformation processes than on innovation, more on the high-tech transfer/adaptation than on high-tech development. In addition we must recognise that the competitiveness of our industries cannot count any more on the help of a programmed devaluation policy of our national currency, as it happened in a recent past. Now, thanks God, Italy is in the Euro system and there is no practical possibility to sell products playing on the skin of the Italian citizens (for sure inflation is the less acceptable form of taxation). The way is another, more difficult but by far more serious: structural reforms, higher efficiency of the production cycles, high quality products, a proper professional education policy. It is not an easy task for our political decision makers, who often show just the "bravery of the ideas of the others" or cover an excellence position in the art of "vaticinatio ex eventu" - as the ancient Romans said - which means to pretend to have understood well in advance what it is evident to-day for everybody. I want to believe that at least one part of our civil society got the point: no way but investing in research and human capital, if the aim is to curb the more and more declining trend of country in keeping the development pace of the other industrialised countries, to safeguard our capability of competing on the world market in terms of both process economy and quality of products.

A few steps in this directions have been already taken and I want to give an example of that in this occasion, presenting to you the case of the Bologna University.

The Bologna University, Alma Mater Studiorum, is recognised by a number of independent evaluations to be in the restricted number of our excellence Institutions for Higher Education and Research. I am not interested to score precisely its actual position in the rank of the Italian Universities: the first, the second or the third place do not make a basic difference; the important aspect is its recognised level in both the Italian and European environments. The Bologna University has an unique characteristic, at least in Italy: it is strictly territory related in the more comprehensive regional frame. When we refer to the about 100,000 students of the University (1200 of them coming from abroad), to the 3200 Professors and Researchers, to the 2700 technical and administrative staffs, to both the 118 three-year and the 53 five-year degree Courses - a number of them implemented under the EU rules - we do not refer just to Bologna, but also to Ravenna, to Forli-Cesena, to Rimini; in one sentence to Bologna and the sub-Region Romagna as a whole. This is a fact of a major importance and I shall tell you why.

In the Academic Year 2001-2002 the Bologna University activated about 70 annual (exceptionally bi-annual) Master Courses which have been attended by more than 2000 graduated students. Most of those Masters - foreseen after either the 3-year or the 5-year degrees - are dedicated to the new technologies, to the advanced engineering techniques, to economics and management, to environment/territory related aspects, to the medical sciences. This means a tremendous effort in terms of both theoretical lectures and practical stages, carried out with the substantial help of the European Social Fund, the contribution of which to the Masters Programmes is of about 3.5 millions EUR, thus allowing to cover the cost of some 35 Masters. A similar number of Courses have been implemented counting on the direct contribution of the participants (in the order 620 EUR per person), thus reaching the target of a full self-sustainability of the Masters related costs, without any additional resource required from the University budget. But a specific aspect deserves to be better clarified. The structure of each Master, according to the "credit policy" of the Bologna University, identifies 200/400 hours of lectures and 300/500 hours of professional stages. Those stages represent a major and highly qualified aspect of the Bologna University effort on the path of the professional higher education; the above recalled integration at the territory level represented the basic element of this strategy. More than 250 excellent productive realities of the Region Emilia-Ro-

magna (Research Centres, Industries, public and private Consortia, Service Centres and Local Administration related technical structures) have been formally recognised by the University - and formally accredited through specific Conventions - as reference organisations for the implementations of the different professional stages programmes. This practically means the creation of an unique regional network at the service of the elite higher education.

The regional approach, however, doesn't imply any kind of closure towards other realities. On the contrary, the Bologna University Master policy looks for a wider participation of other Italian and European Universities/Institutions. A proper higher education approach, in fact, calls for a comprehensive sharing of different experiences, to be utilised keeping the cultural roots and the industrial/technological expertise of one of the most developed Italian Region (the Emilia-Romagna) of which the Bologna University represent a major component.

A further reflection on this matter will conclude my presentation. I refers to the idea of creating the Central European Initiative University (the CEI University) launched in Trieste (November 2001) in the occasion of the Summit Economic Forum (CEI-SEF) which closed the year of the Italian Presidency of the CEI. This idea is expected to be more formally proposed by Italy next week (15 November 2002) during the Skopje CEI-SEF 2002 (13-15 November). Even if the University of Trieste has been proposed to host the Executive Secretariat, the CEI University has to be understood as a typical elite education Institution, basically Masters based, organised through the establishment of a network structure connecting the main Universities of each CEI member countries. Each country will be probably asked to identify a national focal point as a reference of the own educational sub-network. "Ad-hoc" intellectual and financial resources should be identified for a proper implementation of this initiative, which is expected to offer a substantial benefit to the CEI countries in general and, more specifically, to those in special needs belonging to the south-eastern European regions.

The CEI University appears to be a good idea, but its practical success remains to be proved by real results. On the basis of a number of past experiences we have the duty to be prudent, even if this time we can count on an additional, positive perspective. In one-two years since now a number of CEI member countries - Hungary among them - will join the European Union, thus basically reinforcing the UE presence within the CEI, presently referred just to Austria and Italy. This circumstance is of a major importance, underlining the unique role that a selected number of Central European Countries, new members of the European Union, should play for helping the economic transition and the political stability of other CEI member states, still far from the moment of their integration into a more enlarged Union. In this respect, following my understanding, the active commitment of Hungary is of a great importance, especially on the site of the higher education promotion in the region, where a number of aspects related to common roots and cultural heritage could basically help. This is valid in general, but it applies in particular to the CEI University: no doubt that a proper implementation of this initiative needs a strong commitment of Hungary and, more generally, of the other CEI countries new members of the European Union. Let me hope that proper political decisions will favour this process.

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Managing and Organising the Quality Management System of Engineering Education

Prof. János Kövesi—Dean, Head of Department Budapest University of Technology and Economics, Faculty of Economic and Social Sciences, Department of Industrial Management and Business Economics
Tibor Szabó—Secretary General, Budapest University of Technology and Economics
Gábor Bóta—Ph.D. student, Budapest University of Technology and Economics, Department of Industrial Management and Business Economics

ABSTRACT: The recent socio-economic changes have not left Hungarian engineering education intact. Neither did they leave one of its central institutions, the Budapest University of Technology and Economics (BUTE) untouched. Higher education now takes place in a significantly different context and faces numerous new challenges. Managing, defining and carrying out the necessary changes and developments might be successful with the help of modern quality management methods. The quality assurance techniques developed in the industrial sector are successfully applied in all areas of the economy, however, the successful implementation of these methods is still rare in higher education and in specific public service areas in general. In this paper we shall attempt to draw up the conditions which make the successful application of modern quality management methods in engineering education possible.

INTRODUCTION: The scientific branches of financing and management have undergone enormous changes since the socio-political events of 1989. From quality assurance to marketing there is not a single area that would have survived the restructuring effect of the constantly strengthening market economy. The changes have also reached, with some delay, public services. Nobody today would doubt that the business and organisational managment models developed in the business sector can and should be used in public services. Higher education is a special type of public service that has been transformed to a larger extent than other public services in the past ten years:

– from selective-elitistic it has transformed into mass education
– the size of colleges and universities has grown to match the size of national medium and large-size companies in terms of their budget and the number of employees after the integration
– the structure and range of education courses has been transformed; departments,

levels, specialisation tiers and forms of financing show a new abundance.

All these also affected national engineering education. The course of these changes, due to the widespread recognition of the Decree of Bologna and the tangible closeness of the EU accession, is more and more straightforward. In a few years' time, engineering education will certainly become a two-level education. Instead of the originally Prussian model of parallel education, the Anglo-Saxon linear education structure will prevail.

As a consequence, and supposing the current trends in higher education policy remain, the number of institutional programmes and enrolled students will continue to grow. If we also take into account the dynamic growth of adult education and the popularity of life-long learning, then it seems likely that the complexity of the internal processes of institutions will increase, and modern management techniques will play a greater role in managing institutions.

This conclusion is also reaffirmed among national and international experts. According to the European Union's 1997 recommendation: "The scientific quality of research and the quality of the teaching staff do not guarantee the quality of education any more, since the qualitative evaluation of the organisation of programmes, of teaching methods, of the management, structure and communication of institutions are equally important." The same point is expressed more strongly elsewhere: "the management revolution which has taken place in the business sphere will be followed by the revolutionary transformation of the management of institutions in the service sector, because today these two interdependent spheres are almost incapable of communicating with each other." Other professionals and researchers involved in the quality assurance of institutions express similar opinions. Analyses, papers and keynote articles are published practically every week in journals and weeklies on the management and quality of higher education.

In this paper we focus on the relationship between quality assurance and the management and organisational structure of institutions. In our opinion, the investigation of this issue is an essential condition for the efficient implementation of the quality assurance system as laid down in the Higher Education Act, so that higher education can live up to social expectations. We agree with the guidelines proposed by the committee for the implementation of the quality assurance system that were introduced by the committee when the startegy of the BUTE was worked out, and which were aimed at defining the quality assurance of higher education.

"Quality assurance is not one area of the university's operational activity, but an activity that covers the whole of management and operation, and in a sense has a different approach. The quality assurance system is a system of the university's management which does not simply aim at the smooth operation of the university, but which is also:

– customer-oriented

– a system which reviews the processes of operation of the university, and assigns mechanisms to the processes

– aims to improve quality by getting employees involved"

1. To be able to make a comparison between the relationship of quality assurance and the models of management and organisation, it is worth to review the organisational and management structure of (state-run) higher eduaction institutions, which are essentially regulated by the Higher Education Acts, the Public Finances and Public Servants Acts, and the relating enactments. Having overviewed these laws, we can conclude the following:

– State higher education institutions are to

be managed by their tutors, researchers, other employees and students (via representatives), the Ministry of Education as the owner of proprietary rights is not directly involved in institutional management.

– On the other hand, among the employees the representatives of professors play a decisive role in the management of the institution, which is the result of the fact that, besides the law which requires the title 'professor' for higher management positions, essentially, one becomes a university teacher on the basis of the decision of other university teachers.

– The single person in charge of the college or university is the Vice Chancellor, appointed from the staff of the college or university, who shares the so-called tough rights and obligations (for example the rights of employers, responsibilities etc.) with the institution's economic manager. Other managers can only exercise these rights if power is delegated to them. The College and University Councils made up of employees and students can restrict, take away and transfer the rights of the Vice Chancellor and the economic manager.

– Colleges and universities are divided into faculties, educational, research and other organisational units. At the same time, there is no regulation on the size and structure of organisational units, or on the principles or methods of hierarchy, economic policy and sharing funds.

2. In the section below we shall compare the most important models and terms used in quality assurance in the business sector and the corresponding features of state-owned higher education.

Quality management is not a newly coined concept. Measures aiming at achieving the highest quality possible were taken as early as at the dawn of the 20th century (see the works of Taylor, for instance). In the beginnings quality simply meant following the regulations for the different features of the product, and the concept of quality management meant checking the end-product and discarding waste. In the past hundred years, the concepts of quality and quality management have undergone a truly significant evolution, from the post-mortem type of quality control, through quality regulation and different quality assurance systems, to the current concept of Total Quality Management, which is an all-pervading philosophy for the company. On the one hand, this development was followed, or perhaps generated, by quality coming to the forefront of attention, and, on the other hand, by the fundamental change in the concept of the term. Previously, quality meant living up to physical standards, which are easy-to-survey and can be examined against the formulas of the product. In contrast, today quality is identified with meeting the explicit or implicit demands of the customer, with the highest possible standards. This new approach to quality allows us to interpret or even to measure the quality not only of products, but of services as well.

Education, and higher education in particular, has a special position in the service sector, consequently, the initial problems of developing the quality management system arise with the clarification of basic concepts.

The report published by the Hungarian Accreditation Committee's (HAC) Council of Quality Assurance in 1999 describes a method which is based on the concepts of the ISO standard system . For example, students who fail in exams or are expelled, and teachers who are suspended are identified as waste products; the tool for checking the end-product is identified as the final examination. Has the university manufactured a good product, if the graduates with fresh certificates in their pocket cannot find a job, because there is no social or economic demand for their qualification? It is unnecessary to survey whether the student had acquired the knowledge s/he was flooded with in the

course of his or her university studies, if this knowledge is unwanted, or if the department where s/he graduated is perhaps not needed. It may sound like a platitude, but in order to satisfy the demand of the customer we must first get to know what it is.

The issue of teachers leads us to another field. The basic principle of modern quality management and of the TQM philosophy is continuous improvement and full commitment, besides customer-orientedness. Every employee must work to achieve the "best possible quality" in the operation of the organisation, i.e. to live up to customers' expectations. What happens if the employee becomes a hindrance to this improved operation, since s/he does not provide what is needed by the client? It is described as a vital part of the TQM philosophy that the need for change must come from below. However, this cannot be expected of employees, if the result could be cutting down jobs or making workers redundant. Initiatives from below are an important part of the process, but the TQM philosophy malfunctions without the committed support of the management. Tenner and DeToro make the following point about the role of management:

They take the ultimate responsibility for the success of the organisation, and, stemming from their position, in principle they have the scope of authority to define orientation, develop business policy, allocate funds, and to choose the markets they aspire to enter. They are responsible to their buyers, employees and their shareholders for the success of the business.

The older roles of design, organisation, management, synchronizing and control will be less significant. We will find managers instead, who draw up future prospects, line up employees, delegate authority, prepare and look after workers.

The continuous improvement of processes will accelerate if everybody questions the status quo every day. Only managers can provide the circumstances for this challenge...

Let us apply this approach to an organisation where the participants' main goal is to keep up the status quo, or, if this is completely impossible, to minimize the extent of changes. The essence of the authoritarian hierarchy developed along the lines of academic values is that to become one of the elite, one needs to be selected by the elite itself. This rise nevertheless requires the support of other organisation members, which results in the development of an inextricable tissue of personal dependencies. It is, of course, far from managers who have become selected by this mechanism to stir up the status quo, let alone encouraging any of their employees, or even the whole organisation to do so, since changes would not leave them intact.

The afore-mentioned HAC Council sees the solution in setting up committees to deal with quality management issues. In our view this is not necessary: the management should set a course, naturally, with the involvement of experts, and all members of the organisation should act in the interests of this course. A single committee cannot change an organisation. What is more, committee members come from the academic hierarchy (and the job done, they go back to it, or are there simultaneously), which means they cannot be expected to be committed to change and to denounce old bargains when in the role of the committee member.

Another difficulty is to clearly define the structure of higher education, since there are various organisational structures parallel to each other within the university. The academic organisation, faculties, and departments are built up according to the classic functional approach to organisation: the division of work internally is based on organisational functions, decision-making licences are strongly centralised, there is heavy regulation, vertical coordination dominates, horizontal coordination and communication are rare. Economic management, on the other hand, forces the same units into a divisional organisational form, as both faculties and depart-

ments function as cost centres within the university. Organisational build follows the usual matrix format within departments. The organisational behaviour carried by these three types of organisations blend with each other within institutions, causing disorders in communication and in the flow of information, neither of which facilitate quality assurance.

3. Having outlined the main features of the organisational structure and the management, in this section we examine the tools for management. The most significant among these are the rules and regulations of higher educational institutions. The reason for this is that the University Council has the legislative power to pass regulations, which is the only normative legal tool in the hands of higher educational institutions. From the perspective of quality assurance, this means that the regulations are the documents with which the main activites of the university can be described, with whose help quality can be assured, and quality assurance be organised systematically. Based on the findings of the committe mentioned above, the functions and operation of colleges and universities can be divided into the following processes:

- education
- research and development
- social services in connection with education and R&D
- system maintenance and supply services connecting to the above processes

The law requires the making of about 40-50 regulations for these four processes. The content of these regulations is defined by 200 laws directly, and by several thousands of laws indirectly. If we are to secure that excellent work is going on in the workshops of engineering economy, then higher education institutions should have a several-thousand-page long, coherent pseudo code of regulations, at least according to current laws. Not counting, of course, the orders of the Vice Chancellor relating to regulations, managerial circular letters, printed materials, forms etc. It can thus be concluded that, as opposed to the autonomy and independence which has been declared, the synchronization of a fair number of complex rules is needed if we want the quality assurance system of the higher education institution to meet the demands of the "special buyer," and to (also) include the intentions of tax-payers expressed through laws.

4. Having roughly sketched the organisational, management and quality assurance systems of state-run higher education institutions, we shall move on to make the following statements. Hungarian state-owned higher education institutions are in fact educational and research companies...

– for whose services the demand is greater than the supply. The number of applicants to state-financed places almost exclusively proves to be less than needed.

– where the opinion of the buyer of the service has little influence on the state, who finances the service. (Buyer refers to graduates and employers. In this paper we regard neither students, nor teachers as buyers, because their considerations as buyers are better interpreted as the interests of employees than as buyers' demands reflecting social needs.) A part of these institutions' own revenues comes from markets where there is no, or only limited, competition.

– which are mainly managed by their employees, and where the quality assurance policy they adopt will be determined by their approach to and concept of quality.

– where standardized task and performance indicators, which are indispensable for measuring quality, where the scope of authority and responsibility of certain managers, where the conditions of operation for internal organisations, and where the system of management are all undefined, vaguely defined, or have continually changing definitions. The reason for this is the internal struggle for the

allocation of sources of funds (fighting university). None of the interest groups would prefer to make their performance measurable, since it would result in their becoming more helpless against other groups.

– where the models of organisation and management do not give sufficient support to the development and operation of either QA systems: neither to the quality assurance system based on end-controlling, or process regulation (ISO), nor to the one based on the principle of total quality management (TQM). The reason for this is that the main criterion in the selection of managers is not their commitment to the buyer, but commitment to fellow-employees who elect them. When a new manager is elected, the professional competence required for the post is described in terms of competence in the original profession of the applicant, and not in terms of the skills and experience in organisation and management. The organisational structure does not facilitate quality assurance enough, which is due to the incoherence of the external regulatory system on the one hand, and to the interests serving the needs of the participants of higher education there and then, as described above, on the other. An expressive example about financing is given by András Semjén : "The management system of national higher education institutions today displays too many analogies with the classic Yugoslav self-managing company to reject the hypothesis that the natural target function of such a system is the maximalisation of workers' wages. The incentive for efficient staff and wage management, which looks maybe too strict, and which is derived from student-based financing, will at most decrease the natural inclination of institutions for wage maximisation." If we replace tools of financing with legal tools, the result will be the same: the system's natural target function is the development of the most favourable organisational structure, which will very rarely fall in line with a structure that optimally satisfies buyers' demands. (The number of faculties, departments, and programmes will be decided by dominant interest groups, and not by calculating what would be optimal for completing a given task.)

On the whole, it can be concluded that the current organisational and operational models of state-owned higher education institutions do not sufficiently support institutional quality assurance, and, taking into account that the Decree of Bologna, and the new system of adult education will cause processes to become even more complex, it all may result in serious problems as regards technical higher education.

5. Summary and Recommendations

Our paper cannot cover all the causes of the problems, or itemize all the suggested solutions, for its size is limited. The solutions to the problems described above can be placed under the following labels:

A) The proprietor, the management influenced by the proprietor, and the market mechanisms within the institutions of higher education should be modelled to the largest extent possible.

B) On the basis of actually any foundation (a parametred, task-based, or financial basis-based financing model), the new organisational model must be coupled with a transparent, principled and robust model of financing and economic management system.

C) The procedures and systems of quality assurance, human policy, and finances used in market organisations should be introduced. The organisational culture inherent to these techniques should gradually be made to be accepted (primarily by those univeristy professors who can pressure dominant interest groups).

We hope our paper has inspired some thought, rather than shocked its readers. In

case the latter should have happened, we would like to ask the kind reader to carefully think over his or her experiences about quality assurance, and about the management and organisational culture of universities, and to try at the same time to abstract from the position you currently hold in the given higher educational institution.

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Multinational MBA in Central Europe and Berlin - Continuous Improvement by Total Quality Management

Prof. Dr.-Ing. Manfred HECKLE—ESCP-EAP Berlin, European School of Management

ABSTRACT: The "Multinational MBA in Central Europe and Berlin" is starting a new course in autumn 2002 for the eighth time. The evaluation regularly applied in the context of Total Quality Management shows that the participants particularly appreciate the professional and personal care, the internship in German companies, the orientation to business practice and the interactivity of all lectures and other events, the two languages concept, the EU-wide recognition and the scholarship arrangements.
The essential tool of the applied Total Quality Management is the assessment of "customer satisfaction" through anonymous evaluation of all lectures as well as of the Programme Management by the MBA-participants. The feedback of the evaluation results and the decisions of the programme management thereafter may lead to the exclusion of lecturers; but mostly they lead to improved teaching offers of the lecturers and to continuous improvement by the management of the whole programme.

The "Multinational MBA in Central Europe and Berlin" described by the formula "Two Years, Two Countries, Two Languages" thus has in its basic structure distinctive features compared with traditional MBA-Programmes. The Polish, Slovak, Czech, Hungarian and Estonian participants study in the first year in their mother tongue at their home university which is a partner of ESCP-EAP Berlin, i.e. at the Universities of Economics of Poznan, Bratislava or Prague, at the Budapest University of Technology and Economics, or at the University of Tartu, part-time in parallel with their daily job. They thereafter move to Germany to work as a trainee student during a paid company internship of five months. An intensive full-time study period of five months at ESCP-EAP European School of Management Berlin follows, in German language, together in one group with colleagues from the five partner universities who also have successfully finished the first year; students from Western European countries partially join the MBA-group. In addition, a study trip to ESCP-EAP Paris is part of this semester. The successful participants of this two years programme are graduated "Master of Business Administration (MBA)", an academic degree validated by German educational authorities. The

MBA-Programme is accredited by "EQUIS - European Quality Improvement System" and recommended by "Stifterverband für die deutsche Wissenschaft".

A further distinctive feature is the "Total Quality Management" TQM applied at the ESCP-EAP Berlin which uses the "Evaluation of the Lectures" by the "Customers" as its essential tool. There are numerous descriptions in the literature which explain thoroughly the components of a TQM-system ; these have been modelled according to the needs of this MBA-Programme. They are explained in the following sections.

Evaluation has to start with the students: this is a generally accepted understanding for the evaluation of lectures. However, the role of the students as "customers", as persons carrying out the evaluation, or as persons being not yet sufficiently experienced for competent evaluation judgements is seen in differentiated ways. As this case deals with a post-graduate programme for participants with years of practical experience whose average age is 29 years, it may be assumed that these participants can competently judge the different quality dimensions of the programme and its services and that they thus can express the "Customer Satisfaction".

A useful introduction to the problems of evaluation in universities was published by the working-group "Hochschuldidaktische Weiterbildung" of the Albert-Ludwigs-University Freiburg . The application within the "Multinational MBA in Central Europe and Berlin" however was developed earlier; it has been applied since 1996 within six MBA-promotions and is being improved and updated steadily. To report concrete practical experiences is the target of this paper.

The participants of the "Multinational MBA in Central Europe and Berlin" assess or "evaluate" in the first place the lectures of each lecturer based on a questionnaire. This form contains ten performance criteria developed by the lecturers which reflect the ESCP-EAP Berlin's quality understanding for such a programme. This quality criteria are in the sense of Control Engineering the targets to be met by each lecturer and each process of this programme. The participants evaluate each lecturer at the end of his course by quantitative judgements to these ten performance criteria on a five level scale thus assessing the professional and didactic competence of the lecturer from different perspectives. They judge the course related competence of the lecturer, his or her way of explaining the content and context, the quality of materials distributed for preparing and reviewing the course, the stimulation to additional thought of the subject and its value for the own business. Further criteria to be assessed are related to the possibilities of discussing and in-depth-questioning, to practical examples, case studies, group work and training, i.e. opportunities for "interactivity", to complementary contents of the first year and the second year and finally to an appropriate level of the lecture. In addition to this differentiated "bottom up" evaluation, the participants also assess "top down" the overall quality of the lecture. The participants are as well asked to mention verbally the components of the programme they are pleased or not pleased of, not only of the individual lecture but also of the total programme including the organisation and practical execution of all services.

As part of the Quality Management and of the desired interactivity, it is natural that all lecturers in advance record in the study programme the content of their lecture and particularly of the highly interactive components such as case studies, exercises and training units including recording of their duration and keeping these promises. As similarly important part, they have to distribute all materials in advance and to use modern visual tools in the courses. Within the five months semester at ESCP-EAP Berlin, the teaching offer covers 388 hours; 40 % of that time are highly interactively used particularly in case studies and training units.

The personal and professional care and services for the participants are important

further parts of the Quality Management of this programme. This includes supporting the participants during the search period for company internships and giving personal advice for the CV and the application documents. The ESCP-EAP staff may also support participants during the search for a room or apartment. Special scholarships of the "Gemeinnützige Hertie-Stiftung" for participants of this programme and grants given by the Rotary-Clubs of Berlin-Luftbrücke and Warsaw-City belong to the customer services. In addition, a personal tutor for each participant is the partner for discussion in all study subjects and seminar papers.

The results of the evaluation of each lecture and of the total programme executed by all MBA-participants are recorded in terms of several thousands of numbers, complemented by substantial verbal comments. Qualitative and statistically quantitative analysis allow for valuable conclusions for continuous improvement or "Kaizen" as it is called in Japan. The results are summed up to give recommendations for the total programme; these results are given to all staff members and lecturers, are intensively discussed in common and lead to decisions for improving and further developing content and personal structure of the MBA-programme and its processes. It is quite natural that these discussions strengthen the quality awareness of both staff and lecturers.

Important for the "internal" acceptance of the evaluation system is the correct handling of all evaluation results which are related to individual persons; consequently these data are not discussed publicly but individually handed out, together with the average results of all lectures and processes. The lecturer concerned thus has the opportunity to position himself and to compare his personal results with the average result of all his colleagues. He enjoys the benefit that his lecture is not just evaluated as being good or bad, but he receives detailed critical comments and recommendations and therefore valuable starting-points for his own improvement. It is finally not surprising that this positive feedback and the improvements thereafter observed are the rule; the exclusion of lecturers because of lack of improvement is the exception, but is nevertheless applied if necessary. It is also interesting that until now professional competence of lecturers was criticised only in a few cases. Critical comments address almost exclusively didactic criteria, benefit criteria or quality of distributed working materials, i.e. problems which mostly may be solved by hard work and effort of will.

The acceptance and positive view of the evaluation system by the MBA-participants, i.e. by the "customers", is a significant prerequisite to motivate them to constructive and steady co-operation on a voluntary and anonymous basis. As an incentive, the regularly co-operating MBA-participants receive at the end of the programme a personal document confirming their contribution to the Quality Management System; such an experience is certainly useful for them.

The importance addressed within this programme to "soft skills" - as the personality related capabilities are called - is also a component highly appreciated by the MBA-participants. This includes primarily the development of international experience and competence which improve in the international group in Berlin as "international living" just by itself. Courses in "Cross-Cultural Management" and group-oriented "Communication Training" as well as "Assessment Centre Training" also belong to the "soft skills" subject. The fact that this programme develops the "hard skills", i.e. the professional skills daily needed by managers, must not further be explained in detail because in their majority practically experienced lecturers dedicate the major time of the programme to these subjects.

In summary, ESCP-EAP Berlin have had positive experiences with this applied TQM-System, which uses as its core-tool the evaluation of all lectures and processes by the MBA-participants; this positive experience is also proven by the increasing number of

participants, i.e. increasing demand. Owing to the academic and practical experience and the age of the participants, the application of this TQM-System relying on the evaluation by the participants is of important advantage and leads to continuous improvement of lectures and processes, to customer orientation of both staff and lecturers, to higher motivation of lecturers and to high regard of the MBA-participants as the "real customers" of the programme.

Prof. Dr.-Ing. Manfred HECKLE

Head of MBA-Programmes of ESCP-EAP European School of Management Berlin from 1995 to 2001. Since 2002 responsible for further development of the programmes. He has extensive international experience owing to his engineering studies in Germany and France and 21 years of management activity in the Chemical Industry; in addition to his knowledge about Germany, he knows particularly the United States, France and Japan and speaks German as mother tongue, English, French, Japanese and Spanish. Owing to the MBA-activities in Central Europe since 1995, he is familiar with the Czech Republic, Estonia, Hungary, Poland and Slovakia. He gives lectures on "Japanese Competitive Strategies" and on "International Strategic Management".

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Quality Control of Engineering Education

Prof. Ing. Ruzena Petriková, Ph.D.

INTRODUCTION: Quality is as old as human productive activity. The term "quality" has a Roman root, used as opposed to quantity (qualis? or like what? how good?). Over the centuries quality of products/ services gradually acquired properties of higher functional expectations and has been materialized in an evermore changing environment.

The "new" quality is a procreation of WWII. American and Soviet engineers resolved complex problems of accuracy and reliability of weapons and outfit under unprecedented pressures and invented new approach how to reengineer the industry.

Invited to Japan, after WWII, American engineers (Deming, Juran) assisted in implementing the new production system with the centerpiece of quality as their input to the Japan industrial recovery. In the 1960s thru 1980s, Japan has been the world leader in industrial quality. From the statistical process monitoring, to comprehensive quality control and in the end to total quality management (TQM), Japanese companies were harbingers of quality progression.

As before WWII the focus was accuracy, precision, after the war it has been shifted toward reliability. Pioneering products, such as nuclear equipment, air-space technology, telecommunication networks, etc. raised reliability to "hyper- and ultra- reliability" aimed at 100% defect-free processes and industrial artifacts.

In the 1990s, forced by an accelerated globalization, compliance with international standards (issued by the International Standarts Organization, ISO) became a new concern. However, it is the TQM, not compatibility with standards, what has been credited for promoting, competitiveness, productivity and value creation of winning companies worldwide.

In the Czech Lands, signals of change were responded in the early 1960s. All "stars" of the new quality movement (from the U.S., Japan, all countries in the West and East) visited the country and offered their know-how. In the past, major shares of the production were exported to less demanding markets, however, never less than 20 % of exports went to the so-called "advanced capitalist countries". Also the roughly 15 % of military production were never subject to quality compromises.

Now, the Czech labor is respected for its education and skills, low cost, but at the same time for quality. At Skoda (VW Group), the corporate "obession with quality" has been successfully pushed through, at Tesla On (Motorola alliance), the extreme quality of "six sigma" is an accomplished fact. DFI intake is three times as high as it used to be in the mid- 1990s. At the beginning of 2001, more than 130 foreign investors apply for production licenses. Most of them routed to the automotive and electronic industries, both known for their high quality standards.

I. Quality Management of Engineering Education

The idea of quality management is continually spreading from the industry to the services. There are even quality certification proposals in the areas of government and public service. The area of education - especially higher education in engineering - cannot be excluded. The idea of managing the quality of school performance is not new, but the ways of implementing it are of importance. There have been many efforts expended in recent years. In the USA one can find useful information about the ways of approaching the problem at the university level. There are inspirational examples of application of the TQM principles at the universities in the USA, Japan and some European countries. It is well known that in different countries of Europe there are differences in the levels of public or private participation in the higher education. Consequently, there are different approaches to the problem of quality management at the university level.

Our experiences indicate that introducing effective quality systems in engineering education is going to be crucially dependent on the level of involvement, support and understanding by the leadership. In the business environment, the functional systems of quality management were brought about by practical requirements of the market. Globalization trends themselves offer a form of solving the main dilemma: how to combine growing expectations of customers with the competitive needs to control production costs at acceptable prices. The need for mutually advantageous cooperation of producers and suppliers becomes obvious. The formation of effective value chains assures lower cost at the interfaces of interested subjects. In the environment of relative separation of the engineering education, there is usually a lack of sufficient motivation to take quality management seriously. This problem we find at all academic levels:

– insufficient knowledge of quality management
– resistance to change and innovation
– underestimation of quality problems

Effective quality management requires knowledge in a number of technical disciplines of management and control. For most people it is a new way of thinking that is the most important factor. The following aspects are the most important:

– systems thinking inadequacy: in many areas there is a total lack of education in systems, systems applications and systems thinking. Engineering graduate without systems education is insufficiently qualified.
– the lack of statistical thinking: it is important that engineers view processes as random or statistically determined automatically. All necessary practical tools must be at their disposal.
– modern engineers are also managers: they should be equipped with minimum skills in human relations, communication, psychology and sociology.
– there is a need for economic, legal, ethical and moral awareness, supported by requisite education.
– quality is everybody's business and should be viewed as such by all at all stages of the production and educational processes.

The above aspects are not just problem of students but mainly of their teachers. The existing systems of academic evaluation encourage the teachers to persist in their personal habits and modes of behavior:

– insufficient knowledge does not motivate them to enhance their understanding of the problem, but rather they tend to reject the unknown as unimportant.
– any change requires abandoning of accepted orders and administrative procedures. Maintaining functional orders "behind the closed doors" of academic isolation is inadequate. It is the environment, the "open door" policy, that shakes the academics into solving not only their own problems, but those of their stakeholders as well.
– Excessive self-confidence based on noncompetitive, sheltered "certainties" leads to underestimation of significant problem areas. The risks of the "closed doors" policy remain invisible in an overly tolerant environment.

The above observations indicate that starting a system of quality management must be based on well managed and continually

improving processes of knowledge delivery. This approach to quality management succeeded in commercial organizations and offers significant promise in education and especially in engineering education. This suggests a solution: removing the negative factors and implementing process oriented systems of quality management. In educational sphere this is even more important because of the direct social, societal and cultural impacts.

II. Current State

In advanced economies, evaluation and improvement of educational quality in engineering and management is mostly based on the model of quality assurance according to ISO 9000 series. This is often complemented and extended by the methodology of total quality management (TQM), using the criteria of national and international awards for quality, as well as different international activities (like CERTIKED, EQUIS, etc.) in the area of quality improvement in engineering education. In addition to the activities, the basic ideas of TQM can be used and applied in smaller institutions of continuing education. Many existing models of quality asssurance are based on some form of certification, including peer reviews or norms of the EN 45000 series.

III. A Vision of Quality Education of Engineers

Improving the quality of engineering education is an active problem in most advanced countries. There is also a number of actual relevant programs and projects at many national and international universities. For example, in the Czech Republic, the governmental decree of the May 10, 2000, includes such areas of quality improvement as education, training, consulting, accreditation, standardization, metrology, testing, certification, environmental concerns, occupational health and safety, and so on.

This national quality support program remains an open document. It cannot cover all the areas of quality improvement in all aspects of social life. The Czech Board for Quality seeks all ideas and experiences that would enhance practical aspects of the program and contribute not only to the quality of engineering education but to the quality of life of the society as a whole.

With the increasing interests in the quality of engineering education, there are scores of new articles and reports devoted to this emerging issue. It is becoming evident that all such trends and approaches are reflecting the national specifics and traditions of a given country. We should attempt to seek some common features which could help to outline our own ways in this area, and help to identify and remove potential barriers to high-quality engineering education.

At least the following questions should be answered:

- What is effective and high-quality system of engineering education, what are its main characteristics and how does it compare with our current practice?
- What are the functions of effective and high-quality engineering education system?
- How is such system used to achieve the desired outcome of lower costs and higher quality of graduating engineers?
- How do we compare with universities where such quality systems are already in place and what can we learn from them to enhance our own activities?

From the above we derive our proposal to the Commission of WFEO or one of its working groups. During the next stage we attempt to answer the above questions on the basis of accumulated experience we propose certain steps towards complementary education for engineers and implementation of quality system in the management of engineering education.

Highly effective quality system of university-based engineering education comes from the idea that total customer satisfaction can only be realized in cooperation with all partners. The system requires identification and consequent overcoming of all barriers to the effective performance of the institutions (universities) responsible for quality engineering education.

Quality, Higher Education and Vocational Training in Hungary

Professor Pál Michelberger—President, Hungarian Accreditation Committee

1. Introduction

As the President of the institution responsible for the quality of Hungarian higher education, the Hungarian Accreditation Committee, I have two objectives: I have to protect the values accumulated by HAC, and at the same time, I would like to introduce some changes. These values and the new paths will be discussed in this article. Before these, however, I have to refer to my duty originating from my being the representative of the Federation of Technical and Scientific Societies (FTSS)*. The Federation that has sent me expects me rightfully to strive for the interests of the so-called users, who absorb higher education graduates. My mission, thus, is to strengthen the presence of the users in HAC. (*After the 1 July, 2002 the new President of FTSS is Dr. Tamás Zettner)

2. History and Function of the Hungarian Accreditation Committee

If one is to discuss values and new paths, it must be made clear that values are not independent of the context in general, and this is especially true for the level of practical tasks we have to face. For the understanding of the values and novelties, thus the context of the decisions has to be elucidated. First, I am going to account for the foundation of the Hungarian Accreditation Committee, for its work between 1990-2000 and the national context in which it worked.

2.1. The Mission of Higher Education

It was clear in 1990 that the most important challenge the Hungarian higher education had to face was its transformation with the protection of its quality. First of all, a decision had to be made whether Hungarian higher education should adopt the Anglo-American three tier structure, or the Continental dual system of universities and colleges. At that time, when Hungary was aiming to join the European Common Market, the second alternative seemed more feasible. Both systems, however, are similar with respect to the idea that the Ph.D. degree is issued by the universities. It became thus a priority to prepare the way for a major change in the Hungarian system: offering Ph.D. programs and issuing a Ph.D. degree should again be the task of the universities instead of the old Candidate of Sciences degree issued by the Hungarian Academy of Sciences. It was clear that this change could only be introduced at that very time, because there would not be another opportunity for it in the future. For the sake of honesty, I have to say that receiving the Candidate of Sciences degree was not completely independent from the universities, as in most cases the universi-

ties prepared the candidates. There was, however, a major difference: even though it was the university that prepared the candidate: the university was not responsible for the education. Thus, when issuing the Ph.D. degree was given to a university, the university did not only gain new rights, but had to shoulder new responsibilities as well.

To ensure a smooth change, numerous prerequisites were to be created. First of all, the organization of the quality selection and its principles had to be provided. The legal framework for the execution of tasks had to be created as well, along with the financial background. Last but not least, a complex consensus had to be established. Beyond these political, financial and diplomatic tasks it would have been a major flaw to lose sight of the most important thing that could secure the future: the quality. Even the best and most expedient change is worthless, if in the meantime higher education cannot fulfill its mission: training the best educated minds.

2.2. Quality assurance and protection

Accreditation seemed the most feasible solution for preserving the quality of the changing Hungarian higher education, i.e. the establishment of new "Doctoral Programs," new higher education institutions and programs, the already existing institutions and programs. The Hungarian Accreditation Committee focused on whether "the higher education institution can meet the requirements set out in the Higher Education Act with respect to quality." Examining the fitness for the requirements of the Act made the work of the Hungarian Accreditation Committee sensitive to input factors.

2.3. Input: personnel and infrastructure

Accreditation paid special attention to questions of personnel and infrastructure. Emphasizing questions of personnel was not completely new, as Loránd Eötvös, the famous Hungarian scientist, claimed that a university could only be a university through its professors. Thus, what the Hungarian Accreditation Committee meant by analyzing conditions of personnel was the analysis of the scientific achievements and titles of instructors and the quality of students. When checking the conditions of infrastructure, HAC analyzed the condition of classrooms and lecture halls; how well they were equipped; computer and library facilities; and the management. Accreditation focused almost exclusively on these questions of infrastructure and personnel.

2.4. The "small country" effect

The phenomenon, referred to as "small country" effect, made the accreditation process rather complicated. Hungary is a small country, and this results in the difficulty of finding impartial evaluators without any conflict of interest. The number of academics working in the same scientific discipline is so small that it is hardly possible to employ independent evaluators who are not involved in either the foundation or the functioning of an institution, a department or doctoral program.

2.5. The Intellectual Inventory of Hungarian Higher Education

The first accreditation of all Hungarian higher education institutions was completed by 2000. This is true even though the whole accreditation process has not been completed in every institution, as there are still departments and institutions that have not issued degrees. Accreditation, however, can only be finished if a complete educational cycle, including the issuing degrees, can be evaluated. Irrespective of these exceptions, the first round of institutional accreditation has in fact come to an end. A new 8-year-long cycle can be launched in 2003.

The second cycle of accreditation cannot be the same as the previous one, because the Hungarian higher education has gone through some major changes. First of all, the democratization of higher education is in process: this means that by 2010 the 50% of the age cohort should attend higher education institutions. This massification of high-

er education affects the work of instructors, institutions and organizations responsible for quality. Second, the institutional integration - whereby universities and colleges merged for the sake of the rationalization of Hungarian higher education - has been completed, and this requires the introduction of new elements to be evaluated. It follows from the integration that not the old institutions will be accredited but the new integrated ones. The participation in the "Bologna process," which prefers the two (or three) tier system, is the third new factor. Fourth, the great variety of educational forms further complicates the situation. Besides the traditional forms of education, one can enroll to off-site, distance, and Internet based training and educational programs. The multiplication of educational forms results in the rethinking of the concept of quality in higher education.

3. Experiences

The Hungarian Accreditation Committee has enriched the accreditation process not only with the introduction of new elements of procedure triggered by its sensitivity to the changing circumstances, but also by the opinion of the CRE review team in 2000. Synthesizing the results of the CRE (now called EUA /European University Association/) Review into the work of the Hungarian Accreditation Committee is the responsibility of the present HAC.

3.1. CRE Review: elitism, lack of output and openness

The CRE report refers several times to the problem of elitism, i.e. to the phenomenon that HAC overemphasizes the significance of the academic sphere in the accreditation process. This phenomenon, in turn, results in the low representation of the professional chambers and the colleges at the different levels of the work of HAC. Furthermore, the report claims that the lack of "end-users" was understandable during the foundation of HAC, but the changes of the last decade make their involvement in the evaluation of higher education institutions indispensable. According to the review team, this problem is closely related to another one, to the lack of attention to the output factors. When HAC was founded, Hungarian industry and commerce were in a transient period, which justified why they were not involved in the accreditation process, for they had no idea about their expectations concerning higher education and students with degrees. Nowadays, however, the situation has changed.

3.2. New responsibilities

For the understanding of the present situation of HAC, one cannot avoid discussing the old and new responsibilities HAC has to shoulder: evaluation of Doctoral Schools, giving opinion on the applications for university and college professorships, and on new forms of education.

3.2.1. Doctoral Schools

When accrediting Doctoral Schools, HAC had to face a paradoxical situation: the avoidance of encroaching on institutional autonomy and of wasting state money. As a response to the paradoxical situation, HAC worked out a thorough system of requirements the Doctoral Schools had to meet. We all would like the Doctoral Schools to be scholarly and scientific schools and workshops, in the strict sense of the word, where the supervisor and the doctoral student work together, and together secure the high standard of future researcher generations.

3.2.2. Giving opinions on applications for university and college professorship

In 2001 the Hungarian Accreditation Committee began to give its opinion on applications for university and college professorship as prescribed in law. HAC had to deal with more than 200 applications. The expert board, of which 2-3 members evaluated each application, proceeded in the evaluation very carefully. The committee that was responsible for the co-ordination of the assessment of the applications worked in a

circumspect manner: when reading and harmonizing the evaluations, the committee tried to measure the applicants and the applications with a unified methodology while considering the peculiarities of the different disciplines, too. Finally, HAC devoted two entire plenary sessions to evaluating the applications one by one, and making the final decisions via secret ballot. HAC found 66-67% of the applicants qualified for either the university or the college professorship. HAC then informed both the Ministry of Education and the institutions about its decisions.

When giving opinions on applications, the committee was in a difficult situation. Numerous members of HAC wished the DSc or the Doctor of the Hungarian Academy of Sciences title to be the requirement for university professorship. The Higher Education Act, however, does not prescribe the DSc title for university professorship, so the wish could not be recognized. Nevertheless, it was possible to demand the scholarly and scientific achievements that are identical with what is prescribed for the DSc title. This way, approximately one third of the applicants who did not have DS, but only a CSc or Ph.D., were evaluated positively by HAC because their scientific or scholarly activities, publications and international recognition qualified them for university professorship. Conversely HAC refused scholars or scientists with DSc titles, or even full members of the Hungarian Academy of Sciences, too, if they did not meet other, non-scientific formal requirements. For instance, it is a legal prerequisite for a university professor that (s)he holds a habilitation. Consequently, if somebody does not have habilitation, (s)he cannot be nominated for a university professorship, even though (s)he is a full member of the Hungarian Academy of Sciences.

The end of changes has not come yet for two reasons. On the one hand, the change of requirements concerning university professors logically follows from the advancement of sciences and higher education. On the other hand, the accumulation of experiences should result in the refinement of the process of evaluation. The following amendments have been introduced so far: instead of giving the applications to just two evaluators, there will now be three anonymous opponents from the start. The role of the Committee responsible for the co-ordination of the assessment of the applications will primarily be harmonization and the updating of the regulations. The opinions by the three opponents will be discussed by the disciplinary committees of HAC, so as to keep evaluation close to the relevant profession. Both the Committee responsible for the co-ordination of the assessment of the applications and the HAC will vote about each and every application for university or college professorship.

3.2.3. New forms of education

In the case of non-traditional forms of education, the elements of evaluation will be harmonized with the individual forms of education. In the case of distance training, the educational package, the quality of instructors, and their expertise with respect to distance education gain priority, while it will also be assessed whether examinations are at the same level with those for full-time students. When evaluating off-site education, HAC will pay special attention to the way the given subject is taught, and the way its mastery is checked.

4. Strategic Changes

4.1. Input ➡ Input, Process, Output

HAC will devote more attention to the evaluation of the educational process and to the quality of the educational outcome than previously, while it will go on analyzing the input factors (personnel and infrastructure) as well. For this reason, it will assess the following factors after having worked out the appropriate methodology and the particular indicators:

– the quality of the students admitted to the given institution (e.g. the opinion of the instructors about students who completed their first year at the institution);

– the capacity of the institution for innovation, for the development of curricula;

– the instructors' performance as researchers and as instructors;
– the students' satisfaction with the institution;
– the system of requirements (examination questions, and thesis papers), the development of the educational process with the help of the examination experiences;
– the added value provided by the institution during the educational process;
– the expertise, skills and competencies of students who received their degrees from the institution;
– the preparation of and the adherence to the quality assurance plan.

For the sake of the evaluation of the output factors, HAC will propose to the institutions to ask for feedback from students with degrees and from employers ("users") via forms to be filled in or otherwise. Later on, these can become the organic part of the quality assurance systems to be worked out at every institution.

4.2. Increasing the importance of users

There are more user representatives in the present HAC than before. The users, however, do not include only the academic sphere, i.e. research institutions and the Hungarian Academy of Sciences, but also the representatives of professional chambers, industry and other employers. Of course the entire circle of users has not been covered, as it is impossible to represent every profession, sector, and branch in a board of thirty people, but it is not necessary either, because every HAC member is broad-minded and able to represent the interests of all of society and the country beyond their narrow fields.

4.3. Assessment ➡ Assessment and Counsel

The objective of the work of the Hungarian Accreditation Committee has to change after completing the first circle of institutional accreditation. Assessment until now aimed at licensing or refusing the license, or conditional licensing. This type of assessment had its justified historical mission, the situation, however, has changed by now, which should be reflected in the aims of the accreditation. Presently, it seems that the adequate objective is to help the institutions improve quality. Thus, accreditation entails counseling as well.

In line with the enrichment of objectives of accreditation, the second round of accreditation will lay much emphasis on the assessment of the institutional quality assurance systems. Presently, this is the European model, and this is what is recommended to the Hungarian Accreditation Committee. This is the method that is expected from HAC by the Ministry of Education as well. It must be made clear, however, that it is not HAC that is responsible for the quality of an institution but the institution itself. HAC is only to give a hand to institutions in designing and implementing quality assurance systems with adequate management and organization so that they would efficiently support gradual improvement of quality in the individual higher education institutions.

4.4. Overall accreditation ➡ Selective accreditation

Just as assessment is to put more stress on counseling, the subject of accreditation should shift as well. So far, institutional accreditation has assessed each and every department and form of education with the same intensity at an institution. From this time on, however, HAC is going to lay emphasis on the evaluation of the management of the institution, and its efficiency. Besides assessing management, HAC is not going to evaluate each and every department in depth, but it will concentrate on certain selected departments for an in-depth analysis.

4.5. Scale ➡ yes (conditional), no

HAC's objective will continue to be twofold in the future: accreditation and quality assessment. Minimal requirements are indispensable, the presence of a national system that can guarantee quality is necessary for the sake of becoming euro-compatible in this field as well. HAC is going to establish, therefore, minimum requirements, to which

institutions and programs will be compared. HAC's final opinion may be either granting license unconditionally, granting license conditionally or refusing the license, while in the case of institutions and programs meeting the requirements at a low level there is the possibility of special considerations. In the future, institutions and programs that meet the minimum requirements will receive a longer report by the evaluators consisting of advice for the sake of improving the performance of the institution or department. Thus, the activity of HAC will consist of checking and controlling (giving opinions to the Ministry of Education) and also in improving quality (counseling, helping institutions). In the future, the emphasis is going to shift from checking to quality improvement (assessment and counseling).

4.6. Assessment: Vertical (institutions), Horizontal (profession)

During institutional accreditation, HAC will assess the mission statement of the institution, the departments, and those factors that determine the quality of an institution as a whole (macro-quality, management).

The objective with respect to the quality assurance system will lie in the exploratory documentation, in examining the existence and general strategy of the system during the first 3-4 years. It is only later on that it will be possible to introduce the elements of the mixed evaluation in the light of past experiences and practices. HAC is going to provide help, meetings, and opportunities for consultation for the institutions when forming their quality assurance systems, also for the sake of harmonization with the requirements of accreditation.

Program accreditation is going to remain the same as it used to be. During the preparatory period, HAC is going to start working out the details of benchmarking with respect to programs. In the long run, it is very likely that it will be possible to compare programs of the same kind at different institutions with the aid of foreign experts. At first, those programs should be benchmarked that are most related to euro-compatibility.

4.7. Publicity

Activities and accomplishments of HAC should receive much wider publicity than before. For this reason HAC will:

1. regularly publicize reports and analyses pertaining to the quality of Hungarian higher education;
2. point out "good practice," models to be followed that have been found at institutions and programs;
3. organize regular meetings for the dissemination of information;
4. regularly and frequently update its webpage.

The communication strategy of HAC consists of informing stakeholders in particular, and the general public in general about HAC's mission, furthermore of improving HAC's image.

The target groups of the communication strategy are the following:

- leaders and instructors of higher education institutions,
- students of higher education institutions,
- Hungarian Ministry of Education,
- stakeholders of high schools involved in vocational higher educational training,
- the general public (media, higher education interest groups etc.).

The essence of the message to be sent to target groups is that what unites the interests of HAC and its partners with respect to the control of quality assurance systems is the advanced calculability and competitiveness of Hungarian higher education on the international market.

Means of reaching the target groups:

1. HAC regularly informs the stakeholders of Hungarian higher education about its activities, accomplishments, new methodologies, difficulties of assessment, strategic plans in the monthly journal Magyar Felsőoktatás (Hungarian Higher Education).
2. HAC gives a regular overview of its activities related to students in university and college quarterlies, magazines.
3. The links to the Ministry of Education are strengthened via continuous personal

contact and formal reports, and through lobbying (in the positive sense of the word).

4. Those involved in vocational higher educational training will be reached via direct mail and yearbooks.

5. The general public will be addressed via interviews, public relations conferences, through the organization of "open days" and by publishing articles in magazines and newspapers.

6. HAC will inform a wide readership concerning its activities with Publications as in the past.

4.8. International Activities, the merits of Professor András Róna-Tas.

Hungarian accreditation can only be developed and modified if it acquires up-to-date information about European events and trends. This is true because European higher education itself is in transformation and because of the Bologna process. András Róna-Tas, the honorary president of HAC, is a member of the Steering Committee of the European Network for Quality Agencies (ENQA). This means that HAC can learn about the international developments and via him it can also take part in the formation of the international process.

As a result of the work of András Róna-Tas, the Network for Central and Eastern European Quality Assurance Agencies (CEE Network) has been established, and HAC has become the member of ENQA. The CEE Network fosters mutual understanding and learning about the work of quality assurance agencies that face similar problems, as they operate in a similar geographical and political context. The Network plans that the member agencies will recognize each other's principles and procedures in the long run. András Róna-Tas is not only a member of ENQA but he also plays a leading role in the European University Association.

Our colleagues who visit accreditation agencies abroad shoulder great responsibilities. The experience accumulated abroad is to be built into the work of HAC. Agencies operating in small countries enjoy priority, consequently HAC pays careful attention to Danish, Swiss, Belgian, and Dutch agencies. Nevertheless, the English, French and German systems are to be known as well, but their achievements can hardly be grafted onto the Hungarian context directly.

Conclusion

Having sketched the present situation of HAC, the way that has lead here and the possibilities for changes, there is one idea that cannot be overemphasized. The Hungarian Accreditation Committee has never been an end in itself, created for its own sake. It has always been a means that has been justified by being used. Using this means is nothing else but the improvement of Hungarian higher education, and also the protection and strengthening of the international reputation and marketability of the same.

The Importance of Diversified Universities in Modern Society

Professor Michael J Osborne—President La Trobe University, Australia

Distinguished Colleagues:

I regard my invitation to speak at your gathering as a singular honour and privilege and I hope that you will find my theme germane to your deliberations. For my essential objective is to express a profound concern that universities - certainly in my country, but surely also in others - are drifting, or being coerced, into an increasingly functional or utilitarian role, and that in this process they are losing their diversity and, more importantly, jeopardizing their deeper and broader role in terms of scholarship.

This insidious drift towards the functional university is being facilitated, if not hastened, by the absence of any generally accepted view of the role and rationale of a university in current times, as witness the discordant views of inmates, of the media, of the government, of industry and of sundry other interest groups. The root cause for current confusion seems to me to be the movement in recent years of universities from a position on the periphery of society, where they could prosecute their own schemes of education unobtrusively, to one close to its centre, where every activity is likely to be subjected to the glare of public scrutiny. This change of position, which has been either unperceived or ignored by many within and without universities, has been largely brought about by two factors, namely the advent of mass higher education and the financial imperatives of such expansion. A clear and inescapable upshot is that universities can no longer expect to operate as "ivory towers", pursing idiosyncratic programs in idiosyncratic ways; rather they must face up to and accept a raft of responsibilities and expectations imposed by society, or more precisely government. These latter include providing programs explicitly designed to suit student demand rather than staff predilection - and, if I may interpose a personal reminiscence from my far-off student days in Oxford, many of the lecture programs then had no direct relationship to the syllabus and clearly reflected staff interests and expertise; a situation that would hardly be tolerated nowadays! Other desiderata include the provision of a sufficiency of programs to generate an expert workforce, the willingness to be subjected to critical review by outsiders (virtually an annual event in Australia), the necessity of facing so-called "quality audits" imposed by governments, and the absolute requirement of demonstrating effective, efficient and transparent management. In the case of quality audits many countries have tried many schemes and in Australia the whole issue is still desperately flawed in evaluating processes rather than the outcomes, but the simple fact is that such audits are not going to go away. In the case of management

the need for a degree of professionalism in place of the amateur procedures of the past has many infuriated many academics within the university, for whom the leisurely and diverting processes of endless committees with the capacity to frustrate expeditious decision-making are clearly preferable to efficient, accountable management. The account by John Kay of the circumstances surrounding the establishment of the Management School at Oxford provides an egregious example of the collegial capacity to engender indefinite delay. But the reality is that nowadays hysterical complaints on the part of academics claiming that their diminished role in management represents the death of collegiality are futile, ostentatiously self-serving and only too likely to be counter-productive in antagonizing suspicious critics still more. In short we live in a new environment which demands effective management of institutions, and there is no way back to the past. What is needed is a way forward that will on the one hand meet the new expectations set upon universities in terms of academic programs and management practices whilst on the other hand it will preserve the scholarly aspects which have been the traditional features of universities. I have not the slightest doubt that we can fulfil the former desideratum, which is after all only a change in practice; I have grave doubts about our capacity to retain the latter, unless a serious change of attitude is effected at government level.

As will become evident, my basic concern is that current trends and pressures will surreptitiously transform universities into training facilities and endow them with a primarily functional role. Such a concern may strike some of you as unduly alarmist, even misguided, but the current debate over access and funding in countries like my own and in the UK leaves little room for doubt that the governments there embrace two disturbing propositions, which together are inimical to the idea of a diversified university. The first is that university education is primarily related to employment; the second is that the beneficiaries of the enhanced opportunities for employment that derive from a university education should see this as an investment personally and pay for this privilege. The latter has been affirmed in recent times by government officers in both the UK and Australia; the former is nicely evidenced in the strategic aims of the Higher Education Funding Council for England, one of which is "to promote and support productive interaction between universities and industry and commerce in order to encourage the transfer of knowledge and expertise and enhance the relevance of programmes of teaching and research to the needs of employers and the economy". This is a potentially dangerous confluence of views, since it clearly encourages greater emphasis upon the identification of a funding scheme for professional and vocational subjects and puts in danger many fields of scholarship which are not obviously employment-related or currently popular with students, and which, I may add, are quite expensive to maintain in terms of adequate infrastructure support. Such a lurch towards the professional and the vocational is exacerbated in many countries (notably my own) by the growing propensity to export higher education services and by the impact of globalization on such export activity, of which more later.

I should like to elaborate the foregoing very briefly and to suggest that, if we believe in universities as focal points for scholarship generally as well as training grounds for the workforce, we need to articulate a clear, urgent and persuasive case - and to do so NOW before the infrastructure support for traditional fields is allowed to slide down the path of irretrievable decay.

The change from elite higher education systems to large-scale participation has been crucial in changing the nature of the relationship of the university to society and government, and in effectively re-directing the focus of academic activity. The motivation for greater access was (and is) undoubtedly laudable, but some of the outcomes have been unfortunate. One long term effect has been an inevitable drift towards programs that are of practical value for employment,

coinciding, of course, with student demand. This situation can only get worse - or, of course, "better" for an economic rationalist or a philistine - for two reasons. The first is that the greater the number of students the more there are who view university education as employment-related and who expect, as fees become more common and more expensive, a return on their investment. The second is that the government, despite its declining investment, takes a similar view. Thus in Australia a key indicator of success for universities is taken to be the initial salary of graduates, and "league tables" are drawn up on this basis. Again in the UK only recently a Ministerial spokesperson defended an impending change in fee policy by reference to the greater opportunities for remuneration available to graduates, as opposed to non-graduates - and a conservative predecessor had characterized programs in the Humanities and Social Sciences as "luxurious" some twenty years before. Naturally, business and industry are also very happy with such an attitude, since it provides them with trained personnel without cost, whilst in some cases (notably Accounting and Law) they virtually control the syllabus through the medium of professional associations.

This trend is increasingly apparent and in the UK (for example) the aspiration to achieve a 50% level of participation at university is sure to have a dramatic impact. Leaving aside the consideration that such a level of participation can only be achieved by a lowering of standards, and/or a total transformation of the idea of a university, it will surely push universities substantially towards being training facilities rather than centres for scholarship.

What makes the foregoing that much worse is the critical issue of funding - and in most western countries it is probably fair to claim that just about everyone except government agrees that universities are grossly underfunded. (Interestingly, and instructively, our eastern colleagues are investing massively - notably in China, Singapore, Korea and so on, and are being frankly elitist in supporting a few institutions at very high levels.) There is an obvious dissonance between encouraging still greater participation, but reducing public funding, and the effect of current policies in the UK and Australia is likely to be that the very "disadvantaged" groups, whose entry to university broader participation was meant to facilitate, will now actually suffer in the face of ever increasing fee contributions. But it seems unlikely that government support for universities will be increased substantially in the face of competing claims - indeed current levels of support are only too often characterized as "expensive", even "excessive" in many countries. Other sources of funding will thus be indispensable.

Three possible sources present themselves: namely business and industry through a levy or taxation; the students through the instrument of fees; and university income from other activities. The prospects of extracting funding from business and industry, except for customized programs or for specific research, is surely remote and hardly worth discussing, although the (Labour) Government of Victoria (in Australia) has raised it as a possibility in a recent manifesto. The other two sources are clearly viable, but in my view both will serve to entrench the functional or utilitarian model of the university.

Students in many countries already pay considerable sums by way of fees, sometimes, as in Australia, deferred and repayable through taxation subsequently. In the future they are likely to pay more, especially as numbers rise. The justification for fees, overtly declared in the UK recently, is that it is a career investment on the part of the student. The more this view becomes the norm the greater the link will become between universities and employment. So, to put the matter crudely, if additional funding is to be levied from students for a raft of practically useful subjects, where does this leave funding for other aspects of the university? Who on such a scenario will pay for the Humanities and the Social Sciences? How will basic Science attract sufficient funding to serve as a foundation for innovations in Applied Science?

Hitherto, in the company of many others, I have argued that higher education should be seen as an investment not as a cost. Naturally, we had been thinking (how naive we were!) of a national investment in a knowledge-based nation. But, if the investment is defined as one on the part of the student, diversity of university activity can only be constrained, as programs follow student demand. This is surely a serious challenge, and leaving aside the absurdity of arguing that vocational programs benefit only the student (as opposed to industry, business, society in general, or whatever) the notion of a national investment to ensure continued diversity surely needs urgent consideration before it is too late. In many fields of Humanities and Social Sciences already the expertise and the infrastructure, notably in terms of library facilities, is dangerously low with ominous implications if funding in the future is primarily related to student predilection.

To students of the history of universities this looming situation surely represents a stunning paradox and an incredible reversal. For in the UK, the exemplar for Australia, it was only with difficulty in the early years of the last century that universities were impelled to broaden their restricted array of programs to break the stranglehold of Classics and Theology. Now, after a century of diversification, we are in danger of substituting a new kind of narrowness, defined by the professional and the vocational. In other words, we are in danger of moving from a narrow syllabus based on irrelevance to the workplace to an equally narrow one based on relevance to employment. If this is the price of "modernization" (to use a fashionable term) it is surely too high - closer than is comfortable to the dystopia adumbrated in the "Brave New World" of Aldous Huxley and a gross betrayal of the aspirations of his famous ancestor, the polymath and scientist Thomas Huxley, who was a prime mover in diversifying and expanding university studies.

The implications of increasing dependence on student fees to support universities are likely to be exacerbated by indulgence in the other mode of acquiring funding, that is, by external earnings. Leaving aside research consultancies, which are for a specific purpose, the most obvious instrument is the export of higher education services. This is now practised by many countries with developed higher education systems, and in Australia (for example) it is a major source of income for universities. Indeed it is a massive industry, accounting for some 15-20% of all students in Australia and being the eighth largest national export (and growing all the time). Many other countries are competing in this arena, notably the USA, the UK, Canada and, increasingly, China, Japan and Singapore, but for the purpose of my argument, the key point is that almost all of the millions of students involved are undertaking vocational and/or professional programs of study - in various areas of business, finance, management, health sciences, law, engineering and ICT. This is only to be expected, but the effect is again to drive the universities to still greater investment in these fields to the neglect of others seemingly less relevant.

Globalization, which is obviously an inevitable feature of life henceforth, can only make matters worse - or "better" from the point of view of exporters, since it is designed to facilitate their efforts by facilitating movement of money and issue of visas and by permitting competition in other countries. But the reality is that, despite the lofty sententiae of such august bodies as UNESCO to the contrary, globalization can only accelerate the process of assimilation of higher education to a product or a commodity. And in such a context it is sheer effrontery on the part of the various university associations in the USA, Canada and Europe to complain over the inclusion of higher education in the GATS (General Agreement on Tariffs in Services) discussions when they are so obviously treating it as an export commodity. I should perhaps stress that I am not supporting the idea of higher education as a commodity (far from it); rather I am just indicating that it is hypocritical to utilize it as a lucrative export and then complain that

governments are treating it as such rather than as a "public good".

To conclude, I am suggesting that various forces and pressures currently are forcing universities into an increasingly utilitarian role. I believe that this represents a retrogressive step that will impoverish society, if not arrested; but such an arrest is only possible if a clear and compelling case can be made for a university as a centre for diversified scholarship as well as a training ground for the workforce. Assuming that such a model is acceptable, then a clear mode of funding for the future needs to be discovered. This is surely where the concept of investment needs to be revisited. Obviously the notion of student investment in programs that will directly benefit employment prospects is attractive to many, and I doubt that it can be resisted in the long term, unless (improbably) the policy of mass higher education is abandoned. But a public investment in maintaining our universities as centres for learning and scholarship is surely a reasonable aspiration.

So I am arguing that, whilst it is perfectly reasonable and legitimate to demand that universities now play a strong role in providing an expert workforce, in relating to the community, and in contributing to national priorities, this should not be at the expense of their traditional capacity to enrich all fields of human endeavour. The need to find a formula that will support both of these objectives seems to me to be one of the great challenges of the day.

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