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education  
& training  
for engineer**

# ideas

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UNIVERSITY GRADUATES' MANAGERIAL KNOWLEDGE  
AND SKILLS – WAY TO GLOBAL EXCELLENCE

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**Number 12  
November 2005**



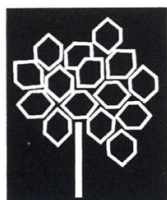
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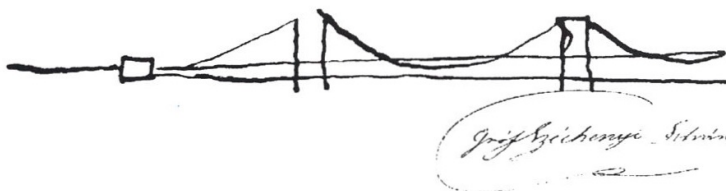


# "MOBILITY OF ENGINEERS"

THIRD ANNOUNCEMENT



March 4-8, 2006  
BUDAPEST, HUNGARY



## AN INVITATION

On behalf of the Local Organizing Committee and of the International Scientific and Program Committee, we are honoured and pleased to welcome you in one of the most important international world congresses of 2006, on "Mobility of Engineers".

The 7th WFEO World Congress on Engineering Education brings together industry and academic leaders, outstanding engineers from around the world. The World Congress is hosted by the Federation of Technical and Scientific Societies, the Budapest University of Technology and Economics and the Hungarian Academy of Engineering. One of the main tasks of the World Congress is to discuss issues of role and perspectives of the engineering mobility in our globalized world.

It is our hope, that the most essential topics to be discussed in six Sessions of the World Congress will draw great attention and interest from engineers and academics worldwide.

It is our intention, that a common declaration should be born in order to convince the governments about the increasing importance of engineering education in the 21st century.

Please join us in this event and you will surely find the opportunity very productive, useful and valuable.

KÁROLY MOLNÁR  
*Chairman, International Scientific  
and Program Committee*

JÁNOS GINSZTLER  
*Chairman, Local Organizing Committee*

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For more information visit our website: <http://congress.mti.bme.hu> or contact the Congress Secretariat 7<sup>th</sup> WFEO World Congress on Engineering Education,

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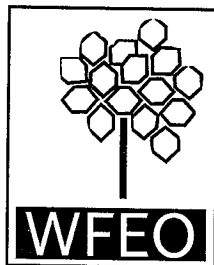
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**WORLD FEDERATION OF ENGINEERING ORGANIZATIONS  
FEDERATION MONDIALE DES ORGANISATIONS D'INGENIEURS**

**COMMITTEE ON EDUCATION AND TRAINING**

**JOURNAL IDEAS N°12, November 2005**

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**EZ A KIADVÁNY A NEMZETI KUTATÁSI ÉS TECHNOLÓGIAI HIVATAL,  
VALAMINT A MTESZ TÁMOGATÁSÁVAL KÉSZÜLT.**

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# CONTENTS

<b>Introduction.....</b>	<b>5</b>
<i>Prof. János Ginzler - President of the WFEO Committee on Education and Training, Hungary</i>	
<b>Effect of Business Knowledge on the University.....</b>	<b>7</b>
<i>Dr. Kövesi János, professor - Zsuzsanna Herbály-Tóth, Assistant Lecturer - Tibor Szabó, Assistant Lecturer Budapest University of Technology and Economics, Hungary</i>	
<b>Quality Management Roleplay Simulation (Description and Knowledge).....</b>	<b>21</b>
<i>Assoc. prof. Kristina Zgodavova, PhD., Technical University of Kosice, Slovakia</i>	
<b>The Special Needs of Developing Countries in the Field of Engineering Education.....</b>	<b>34</b>
<i>Kazuo Kuroda, PhD., Waseda University, Japan</i>	
<b>Fundamentals of Management for Engineers.....</b>	<b>39</b>
<i>Peter Inzelt, Computer and Automation Research Institute of the Hungarian Academy of Sciences, Hungary</i>	
<b>Evaluation of Training Effectiveness.....</b>	<b>43</b>
<i>Prof. Ing. Ruzena Petříková, Ph.D. - Ing. Alan Vápeníček, Ph.D. The House of Technology Ostrava, Ltd., Czech Republic</i>	
<b>Teaching Business Disciplines at the Budapest University of Technology and Economics - Opinion of Stakeholders.....</b>	<b>49</b>
<i>Dr. Kövesi János University Professor - Finna Henrietta, Assistant Lecturer - Szabó Tibor, Assistant Lecturer Budapest University of Technology and Economics, Hungary</i>	
<b>History of the WFEO Committee on Education and Training.....</b>	<b>65</b>
<i>Prof. Miguel Angel Yadarola, Past President of the WFEO CET, Argentina</i>	





## Introduction

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

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Taking into account the most important items as science, technology and innovation for achieving UN Millennium Development goals it is evident, that managerial knowledge is essential for global excellence.

Methods are worked out to measure how and what extent business trainings, research and development in the field of economic sciences have enriched knowledge capital of the Budapest University of Technology and Economics. The results are summarised by Prof. János Kövesi, Ms. Zsuzsanna Herbály-Tóth and Tibor Szabó.

The article of Ms. Kristina Zgodavova deals with the so-called QM-RPS (Quality Management Role Play Simulation) process. According to her experiences the long-term application and development of QM-RPS have proved its high effectiveness both in educational processes and in the improvement of processes in organizations.

According to Dr. Kazuo Kuroda among the special needs of developing countries in the field of engineering education the regional cooperation plays an important role. To support and enhance this kind of direction, legal and practical systems for the international recognition of qualifications should be constructed.

Management requires a very broad and complex variety of knowledge. Peter Inzelt underlines in his article, how important is the need of some basic knowledge and understanding of law, finance, accounting, market-

ing, etc. for the young engineers in their everyday tasks.

Prof. Ruzena Petriková and Dr. Alan Vápeníček summarise their experiences about training effectiveness. Training is used by the standard (ISO 9000:2000) in the context of professional ability – as a prove ability to apply knowledge and skills.)

In the article of Prof. János Kövesi, Ms. Henrietta Finna and Tibor Szabó the opinions of the young engineers, who have got their degrees at the Budapest University of Technology and Economics about the business and management education are summarised.

The History of the WFEO Committee on Education and Training in the period of 27 years (1970-1997) is summarised in the excellent paper of Professor Miguel Angel Yadarola. After taking over the WFEO CET Secretariat (by the MTESZ) in the 1997, we continued the publishing of the annual journal of the IDEAS, dealing with up to date topics and collecting articles from outstanding authors from all over the world.

The main topics of the different issues of IDEAS published in Hungary between 1997-2005 were, as to be seen below:

- IDEAS Number 5, September 1998:  
Continuing Professional Development
- IDEAS Number 6, October 1999:  
The Impact of Globalization on the Engineering Education and Engineering Practice
- IDEAS Number 7, November 2000:

The Necessary Basic Knowledge and Abilities for Engineering Education

- IDEAS Number 8, November 2001:

Internationalisation of Engineering Education

- IDEAS Number 9, November 2002:

Quality of Engineering Education

- IDEAS Number 10, December 2003:

Future Directions of Engineering Education and Continuing Engineering Education

- IDEAS Number 11, November 2004:

Special Needs of Developing Countries in the Field of Engineering Education

- IDEAS Number 12, November 2005:

University Graduates' Managerial Knowledge and Skills – Way to Global Excellence

Let me thank very much the most useful work and help in editing this number for all

distinguished authors, for the members of our Editorial Board, for Prof. Miguel Angel Yadarola, Dr. David Reyes Guerra and Dr. Stefanos Ioakeimidis; for the President and also for the Director General of the Federation of Technical and Scientific Societies (Hungary), Mr. Gábor Széles and Ms. Ágota Kósz and also for the Secretary of our CET, for Mrs. Zsuzsanna Sárközi-Zágoni.

The Secretariat of WFEO CET will move (after 8 years) to Poland to NOT, thanks to President Dr. Wojciech Ratynski and Secretary General Kazimierz Wawrzyniak. We wish the new CET President, Prof. Włodzimierz Miszalski, the CET Secretary Ms. Teresa Domanska and the CET Deputy Secretary Mr. Stanisław Konieczny lot of success for their further activities.



# Effect of Business Knowledge on the University

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## 1. SHORT HISTORY OF BUSINESS TRAINING AT BME

Engineering higher education has experienced a great development in the past hundred years. Changes of engineering education has been influenced, first of all, by the technological development never seen before and generated often just by the research results of higher education, consequently, curricula and content of the constituent subjects have transformed drastically. Even more, also social and economic changes of the 20th century affected engineering trainings delivering knowledge material both in science and practice. Higher education in countries of Central and Eastern Europe has been strongly influenced by rapidly changing social systems having feudal traditions and later experimenting with the state socialism (communism). Thus, scope and content of economic and social knowledge delivered in the engineering education were highly determined by the ideology and economic policy of the government in power. Nevertheless, mass size of the higher education as

observed all over the world and emerging social-economic models in Central and Eastern Europe based fundamentally on market coordination seem to open up perspectives for business training in engineering higher education (too). In this paper we review the Budapest University of Technology and Economics, from its foundation the biggest and determinant university of the Hungarian engineering higher education. We briefly describe the place and role of the business trainings in the past about 100 years. Then we try to measure the effect of business trainings on the university's knowledge capital – relying on the evaluation methods of knowledge management.

We divide the historical review of the business trainings at the BME in three phases, covering three absolutely different epochs where the University followed different educational concepts, in line with the expectations of the actual „stakeholders”.

First we outline the period from the beginning of the 20th century to the end of the World War II. At that time the economy of the country followed the West-European

trends, and the industrialising country needed engineers in growing numbers. Requirements set for engineers are gradually changing, the rapidly developing economy seeks engineers „that understand economic issues related to solution of engineering problems, and also in business have the same initiative approach that is indispensable for causative solution of engineering problems”. This is cited from the plan for engineering further education designed by professors of the University. As a result, graduate training of economists was launched in 1912 at the University of Technology, and then from 1914 engineer-economist diplomas were issued – first in Europe. Economic further education of engineers had solid foundations: economic and accountancy studies constituted more than 5% of mandatory number of lessons for students of mechanical engineering and chemistry already in 1898 [1]. In 1934 the Royal Palatine Joseph University of Technology and Economics was established with 5 faculties integrating the economic training provided at the Budapest University of Sciences and Budapest University of Technology. One of these five faculties was the Faculty of Economics providing training of engineering students in economics, law and management, in addition to training economists. That time, Professor Heller Farkas (1877-1955), a determinant personality in economic training at the University of Technology, proposed – in a draft for curriculum development – to include the following subjects in the training leading to an engineer-economist diploma: *History of Economics, Economic Policy, Finances, Statistics, Law, Industrial Economics, Balance Sheet Studies* [2]. The best way to prove the modernity and durability of his proposal is to compare these disciplines with subjects offered in the curriculum of the MBA training of the University of Technology, being standard for the present business further education within higher education, or subjects offered for undergraduate engineering students by the BME, Faculty of Economic and Social Sciences. All subjects proposed by Professor Heller can be found here, surely under different titles and with highly deviating contents. Foundations

established in the subjects listed above are still constituents of modern business trainings – on engineering basis –, just like some decades ago.

The system change after the World War II brought a turn in business trainings offered in engineering education, indicating the beginning of a new epoch. Higher education was restructured according to the Soviet example establishing „specialized universities” and „specialized colleges”. Within this process – based on the Faculty of Economics of the University of Technology – the Hungarian University of Economics was established in 1949; subject matters of the „business” trainings at the University of Technology were delivered at the departments of the engineering faculties, not at an independent faculty. Not only organizational frameworks but also content of the trainings in the fields of economic and organizational sciences became poorer. „Engineering engineers” hardly had – by their role in the planned economies – any economic functions and jobs in creating material goods. Heads of companies did not need to deal with issues like market situation of products, customer requirements – their only job was to produce products from the available materials [3]. Development of the economic and organizational science in Hungary was adversely affected by integrating the approach prevailing in the Soviet Union saying that existence of an independent science discussing management and organization was unnecessary [4]. Accordingly, „business” training concentrated on economic planning of industrial plants, on their organization and administration, the word „management” was not even used [5]. Attenuation of strict planned economy had a positive effect on business training of engineers, too: from 1961 at all the six faculties of the University – although for a low number of students – postgraduate training of engineers-economists (specialized engineers) became general, supplying new generations of directors to the industry [6]. The economic reform in 1968 integrated a lot of market elements in the framework of the planned economy, and appearance of graduate training of engineer-organizers as



an independent module in the 70s could be attributed mainly to this fact. In addition to „business modules” (engineer–organizer) launched as graduate training at the Faculty of Mechanical Engineering and Faculty of Chemistry, this type of postgraduate training was started also at the Faculty of Electrical Engineering – with a similar content – under the name of „specialist engineer–organizer”. At the University having 6 faculties as of 1969 – being that time the largest university – and working under the name of Budapest University of Technology as of 1952, at the Faculties of Architecture and of Civil Engineering, „business” training was organized again within the specialist engineer training, while within the graduate training this type of knowledge was integrated in the subjects offered by the individual professional departments. The Faculty of Transportation Engineering was in a unique situation in this aspect as the Faculty delivered education about services within the basic training of the Section Transportation Engineering; consequently there was a great emphasis on business knowledge – both in graduate and postgraduate training. In the 70s of the last century the University of Technology developed into an acknowledged professional consulting institution in the fields of management and organization. The Department of Industrial Economics headed by Ladó László played an important role in the history of management consulting in Hungary [7]. Till the new change of the social system in 1989 – in line with the needs of the economy becoming increasingly liberalized – economic sciences became more and more important at all levels of education almost at all the faculties. The subject matters offered have gradually enriched covering fields from traditional industrial economic and corporate economic approaches through quality control and project management to the modern labour economy and corporate finances.

The third phase can be counted from 1989 when market economy emerged in Hungary. From this time business trainings have undergone a rapid development at the University of Technology and encompassed all

units of education. Major elements of the changes:

- *Political economics* is not taught any more and is replaced by modern courses of macro- and microeconomics;
- Postgraduate MBA trainings are launched in 1992 and become soon the most popular manager courses offering diploma in Hungary;
- In 1998 the training *Engineering Management* was launched, the Faculty of Economic and Social Sciences established, and the name of the University changed into Budapest University of Technology and Economics in 2000;
- Graduate training for economists started in 2001;
- In 2005, – in the educational field of economic sciences – two additional programs are licensed by the competent ministry; share of economic sciences within the graduate engineering education reaches 15-20%.

Qualification requirements of engineering higher education are regulated by law saying that not less than 10-15% of subject matters shall provide economic and human knowledge. Their exact shares are specified in an order of the Senate; in addition to the mandatory general economic, legal and management subjects to be studied by graduate engineering students, the Faculty of Economic and Social Sciences offers about 20 subjects. In the educational field of economic sciences, also specialized departments of the engineering faculties provide business studies within a wide range of subjects – utilizing interest of engineering students and departments’ staff in economic sciences. These changes are not simply driven by the switch over to the market economy; increasing share of the sector of services in the national economy, and also the characteristic size of the players in the economy have their contribution: engineering experts with different competences are needed today. At present the objective of education is to train engineers meeting expectations of small and medium-size businesses, being familiar also with services and equipped also with economic and entrepreneurial capabilities in addition to the techno-

logical and natural scientific background in the narrow sense of the word. Results of different surveys prove that people with a degree are expected to have interdisciplinary background, be competent in social and economic issues as well as in solution of organizational and management problems [8]. „Obviously, public facilities and companies need this type of engineers” – asserted professor Zelovich Kornél (1869-1935), Rector of the University of Technology at the time of voting about the Senate’s decision concerning the introduction of training engineer-economists in 1912. We think that engineering education at the University of Technology – catching up with the higher education in Western Europe and Overseas – has again reverted to the thoughts formulated in the first citation of this paper. Engineers of the future are increasingly expected to take over management and financial liabilities. That is why further education programs for engineers discussing engineering – financial – commercial – business issues play a determinant role in the engineering training system in more and more countries – often as an alternative to the PhD degree.

## 2. GENERAL PRINCIPLES AND PROBLEMS OF MEASURING INTELLECTUAL CAPITAL AT STATE UNIVERSITIES

In this section and the next one we try to review the effects of changes in content and quantity of business studies offered in the engineering training after the 1990s on the knowledge capital of the Budapest University of Technology and Economics. In literature we find a number of methodologies to measure intellectual capital – at company level; in the following we demonstrate the measurement framework acknowledged internationally.

There is a general consent about four constituents of the intellectual capital: *human capital*, *structural capital*, *technological capital* and *relationship capital* together form the knowledge of a company in a wider sense. The various analysing and measuring methodologies have different approaches to

classify elements of the intellectual capital; research aims at establishing a unified approach for defining the term intellectual capital.

*Human capital* comprises knowledge of the staff members of the individual organizational units and implies their capability to generate and develop this knowledge. Thus, human capital contains knowledge of the individuals and organizational units as well as teams, and their capability to leverage this knowledge within the organization. As elements of the human capital we list

- *Values and attitudes*: a kind of knowledge of internal motivations triggering individual actions;
- *Aptitude and ability*: knowledge that individuals have concerning something and ability to succeed in their jobs;
- *Capability and know-how*: knowledge concerning working based on individual experience and practice.

*Structural capital* is the combination of knowledge and invisible capital elements originating from the organizational actions, being the property of the organization, and the organization does not lose it when a member drops out. In an aspect, structural capital is the combination of invisible formal or informal capital elements that build up and develop the action of the business organization. The main items include

- *Organizational culture*: system of values, standards, behavioural forms that is accepted by all members of the organization.
- *Organizational structure*: formal way of operation.
- *Organizational learning*: ability to develop new competencies enabling the organization to meet the changes adequately; and the organization’s ability to develop.
- *Processes*: system of actions covering the full operation of the organization, including external and internal customers and suppliers.

*Technological capital* is a defined set of invisible elements directly related to the functions and actions of the technological system of the organizational operation and



primarily contributing to manufacturing the products having specific properties. Technological capital comprises four elements:

- *R+D*: efforts made in the field of technological innovation processes;

- *Technological infrastructure*: set of knowledge, methods and practices that are integrated by the company in its processes;

- *Intellectual and industrial wealth*: knowledge owned legally for utilisation of which the organization that created it grants the right at a predefined time and on a predefined territory, like patents, trademarks, brand utilization, etc.

- *Innovation results*: developments embodied in existing products, processes and management methods appearing in index numbers of costs, quality and output.

Finally, versatility of the external factors around an organization requires making a clear distinction between business capital and social capital that is called usually *relationship capital*, or in another approach defined as customer capital constituents. Business capital implies the system of the company's connections and its value, and it plays a role in supporting and maintaining major factors of the company's core processes. Constituents include

- *Connections to customers*: connections to various customer segments; customers are parties that have or may have claims concerning outputs of the company's basic processes, i.e. products.

- *Connections to suppliers*: suppliers are parties providing the necessary resources for the basic business processes.

- *Connections to owners, institutions, investors*: they form the market where the company acts.

- *Connections to allies*: co-operation agreements concluded by the company with various organizations; their power, duration may vary, or they may have a defined duration and may be established in different structural arrangements.

- *Connections to competitors*: connections to the competitors in the same or a related industry.

- *Connections to quality development, adver-*

*tising and promotion organizations*: connections aiming at development of the processes and products, and at support of the organization's management in the given field.

Social capital comprises all values originating from the company's connections to social factors acting in its environment, in form of integration, co-operation, engagement, social liability. Its basic elements are as follows:

- *Connections to public administration offices*: interactions with the authorities serving general interests of the society.

- *Connections to media and units affecting the company image*: relationship with the mass communication aiming at forming opinion on a company's brand or a company itself.

- *Approach to environmental protection*: protection of the natural environment, support of initiatives protecting the environment.

- *Social connections*: connections to the trade unions, organs of the labour market in order to create new workplaces, improve labour quality and ensure employment stability.

- *Organization's fame and reputation*: connections maintained with various social elements (markets, offices, citizens, external customers), and actions contributing to a favourable social picture.

We demonstrate here three qualitative estimation models developed for measuring intellectual capital:

- *Balanced Scorecard (BSc)*. This method evaluates the company – in addition to the financial key figures – also in terms of customer and operational processes, learning and development, thus, providing information to persons dealing with strategic management [9].

- *Intangible Assets Monitor (IAM)*. This method has been designed for supplementing the financial indexes, focusing absolutely on the change in intangible assets. From this aspect, the external and internal structures of the company, as well as the employees' competences are analysed. This again supports strategic analysers. As compared to the BSc, it expressively promotes knowledge-orientation, while BSc regards the company strategy as stable [10].

• *Skandia Business Navigator* (SBN). This method is similar to BSc in many aspects. It focuses on five fields (finances, customers, human resources, processes and development/renewal) and assigns key indexes to each focus, about thirty in total [11].

Before demonstrating the methods by which we tried to measure how and to what extent business trainings, research and development in the field of economic sciences have enriched knowledge capital of the Budapest University of Technology and Economics, we describe some problems of methodology and measurement. In the former researches, Hungarian state universities were identified as authoritative self-directing socialist companies [12]. In addition to numerous properties, it was stated that the most important objectives of the self-directing organization – financed by the state (tax payers) – were to extend individual and collective employee's rights as well as to maximize wages and salaries and other benefits of this type. First of all, own employees are regarded as customers, with older and higher-ranking employees as beneficiaries in accordance with the authoritative structure. This special organizational status results in a specific organizational culture with effects on the intellectual capital as summarized below:

1. *In terms of knowledge management* the most important fact is that for a self-directing socialist company the aspects of employees are decisive when accumulating its knowledge capital. Accordingly, within the wealth of the organization only elements grow that can be at right transformed by the employees and the elected leaders into private income. Therefore, as an example, state universities hardly invest in maintenance and replacement of the built environment within their assets as usual. The same applies to intangible assets (e.g. proprietary rights), to patents, inventions; they remain in the organization's ownership only if their administration costs supersede the income originating from their utilization. We can point out as a rule that even though members

of the organization have a considerable knowledge capital, in most cases the organization is involved in their utilization as a „subcontractor“. Formulating a little bit more drastic: **Primary objective of a state organization directed by the employees is the growth of the (knowledge) capital of the individual employees rather than that of the organization.**

2. *As customers and high-ranking employees* are almost the same, for a state university the increase of the income of its employees (due to the authoritativeness: especially income of its leaders) constitutes a value in itself (they go abroad, work also for other companies, they are awarded in connection with their work off the university, etc.). **Due to this interpretation of the customer position, some constituents of the intellectual capital should be interpreted differently.** As an example, the quality assurance system has another meaning, aiming in this case at maintaining the life quality of the employees rather than at research and development (as major processes of the organization). Also financial management is meant differently, maximization of wage-type benefits is much more important than maintenance of the hard budgetary restraints, etc.

3. *A state university strongly depends* on the impacts of the bureaucratic co-ordination mechanisms. Although its revenues can usually be divided into state subsidies and own incomes, actually, they are almost exclusively state subsidies. The decisive part of own revenues comes from the state budget or state funds in a way, while (re)selling concessions, licenses, trademarks, patents and similar rights constitutes a small part only. Its reason is obvious: a state university builds the best relationships to the subsystems of the state budget, and this subsystem is – as compared to companies – much more generous, and also its budgetary constraint is softer. However, own revenues obtained this way (from the state budget) are always labelled subsidies, grantor of the funds certifies this way that the grant is not merely a present. From this fact may follow that in a year

incomes obtained for research, subject matter development or social facilities etc. may essentially grow – without any prehistory, or surely not expectably on the basis of the analysis of the financial statements or analysis of strategic goals prepared in the previous years. The same applies to costs too; sudden growth or drop of personal costs can hardly be deduced from strategic plans (often not existing). Both can be caused, e.g., by governmental intervention (growth either by an essential increase of wages and salaries in the public sector or by generous R+D supports, drop by change of tax laws for promoting an atypical employment relationship). This hectic movement of financial key figures are not always followed by changes of the capital elements that can be described by natural data like similar sudden increase or decrease of number of contracts for employees, number of employees with scientific degree, or any other index figure. (This theorem holds also in the other direction: as an example, as of 2002 a law prescribes that a contract should be concluded with students in the paid courses. As a consequence number of contracts computed for an employee or student has increased – but it is not the case for revenues or intellectual capital of the institution.) **Due to deviations caused by the bureaucratic co-ordination sometimes unexpected but often enforced by the university, intellectual capital of the organization can be measured with difficulty.**

*4. According to the rules of the authoritative culture, climbing on the employee ladder is connected with privileges. The most important and wanted privilege is the exemption from the employee's liabilities. A self-directing hierarchical organization is able to support changes only slowly, in paces, in accordance with the interests of the persons at the top of the hierarchy, it rarely awards outstanding achievements, and does not promote a competition enhancing quality. Employees can use their leisure time – embedded in working hours –, usually increasing with age, actually for any other activity, even for ones decreasing (knowledge) capital of the organization (like foun-*

*dation of an organizational unit at another university, research institute, etc.). **Elected managers are not necessarily interested in enhancement of the knowledge capital of their subordinates, in renewal of the organization.** They may lose their jobs as leaders and the achieved privileges.*

As summary we can state that in measurement of knowledge capital of state universities we cannot apply mechanically the corporate methods already developed. In these organizations index of satisfied customers or quality index is interpreted differently. If we regard the University as a competing capitalist company engaged in training and research, we surely would be surprised by the fact how much time and how high sums are spent to organizing conferences and visits abroad for building relationships, at least as compared to the resulting revenues and number of training and research projects jointly with partners visited. Based on the experience it can be difficultly decided whether the high share of elderly employees definitely enhances the – revenues yielding – knowledge capital of the organization or just the opposite: employees higher on the ladder shift a part of their jobs to younger colleagues while they utilize their human and/or relationship capital in another (higher educational) institution. Not knowing the operational principles of state universities it seems to be a strange fact that one of the best financed activities of the University is the state-financed PhD training, however, providing the same training within paid courses, the resulting revenues are minimal. When analysing financial data, also the fact should be taken into consideration that around the state universities a lot of foundations and businesses emerge aiming at raising the efficiency of the transformation of revenues originating from the University activity into personal income – bypassing the University. For further enhancing this efficiency, when these revenues are inescapably paid to the University, invoices issued by these „background companies“, „university-related civil organizations“ often appear in the profit and loss statement as costs – the situation is sim-

ilar to the relationship between budgetary organs and related public foundations, non-profit organizations in the state budget system. Measurability of knowledge capital is hampered also by the fact that terms and definitions used in the sphere of companies (like profit, market share, order) can be interpreted with difficulty, after their re-formulation only. From this follows that interpretation also of key figures and specific measures deduced from these terms requires a new approach.

Considering all this, we searched for evaluation methods that unambiguously measure the changes of the knowledge capital of the organization. In Appendix 1 we list the measures and specific key figures that we consider to be able to promote enhancement of the knowledge capital – realization of the organization's strategic goals – at the universities having close similarities to competing market organizations. This means that the key figures listed in the Appendix underlie the assumption that the university is a competing capitalist company as described by Kornai [13]. The (or more precisely any) evaluation system belonging to the key figures listed there is not applied at the Budapest University of Technology and Economics, therefore in this paper, for the analyses we have chosen data that are the nearest to the measurement methodologies considered by us desirable and are available from the present databases.

### 3. EFFECT OF BUSINESS KNOWLEDGE ON THE INTELLECTUAL CAPITAL OF THE UNIVERSITY

#### 3.1. *Measurement of the knowledge capital in terms of expenditures and utilization*

In terms of expenditures and utilization, growth of knowledge capital is measured by cost reimbursement paid in the relevant further education programs. Due to the available deficient and imprecise databases we decided to choose for comparative analysis, in addition to the Faculty of Economic and Social Sciences (GTK), an engineering facul-

ty that is in terms of all natural key figures (number of teachers and researchers employed at the faculty, size of area used etc.) somewhat larger than the faculty providing business training. As baseline condition we considered that utilization of the intellectual capital in other – typically state-financed – trainings and other activities is the same at both faculties. First we reviewed the amount of cost reimbursements paid in relevant further education programs and found that the sum paid on average by the other seven faculties of BME did not reach the tenth of cost reimbursements paid at the Faculty GTK. In relevant further education programs – unlike the basic education – the faculties themselves define the curricula of the provided training and price of the services. However, relevant further education programs can exclusively be organized by higher educational institutions, and what is obtained enriches the (knowledge) capital of the institution. A contract is concluded with students participating in a paid training, the faculty can use the revenues as it likes, there are no limiting laws and rules. In general, we can say that relevant further education programs provided at the University of Technology are greatly similar to classic projects of companies.

Figure 1 shows the revenues from relevant further education programs of the Engineering Faculty examined and the Faculty of Economic and Social Sciences in function of time. We can state that, in addition to growth of revenues, the dynamics of this expansion is monotonously increasing. On the other side, we see the low values at the engineering faculty, on top, stagnating even at nominal value for years. This comparison reveals that the knowledge capital of the faculty involved in education business is poorly managed and/or is low – as compared to GTK.

#### 3.2. *Measurement of knowledge capital by self-appraisal methods*

Out of self-appraisal methods we review the satisfaction of students concerning the institution, with special emphasis on judge-

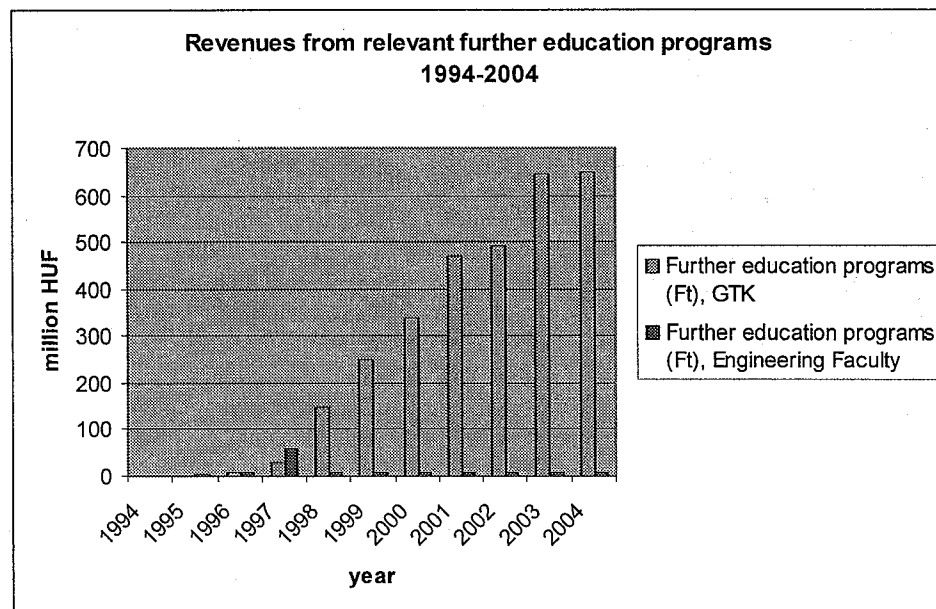


Fig. 1: Revenues from relevant further education programs  
Source: BME Economic and Technical Chief Administration

ment about subjects delivering financial, legal and communication knowledge material. Below we publish the results of related surveys at the University.

The University of Technology permanently measures the employment circumstances of fresh graduates in the labour market by questionnaires. Methodology of the survey and the clear questions allowed taking data of all students graduated between 1997 and 2002 into consideration.<sup>1</sup> Survey was always carried out on the whole probe; return rate of questionnaires was in the order of years as follows: 36%, 26%, 26%, 30%, 25%, 37%. Within this follow-up survey, opinion of the graduates about strengths and weaknesses of the university education was asked. Within strengths students could choose from categories practical issues, preparation for professional problems, financial, legal and communication issues, discussion of human relation-

ships and other. The methodology's clearness is underlined by the fact that subjects discussing financial, legal and communication issues are almost exclusively taught by the Faculty of Economic and Social Sciences at the University. Delivery of financial, legal and communication knowledge material is indicated among strengths of the University by 10% of students on average. The students graduated in 1998 had the most favourable opinion (12%) until now, while students that finished their university studies in 1998 had the worst opinion producing a negative peak of 5%. There is an important characteristic in answers of the various faculties: In the case of Faculties of Mechanical Engineering and of Transportation Engineering, these subjects are represented as strengths with an essentially larger emphasis (although this rate strongly decreased in the case of graduates in 2002 – in the case of other faculties it shifted in the

<sup>1</sup> A Budapesti Műszaki és Gazdaságtudományi Egyetem friss diplomásainak elhelyezkedési esélyei (Employment Chances of Fresh Graduates of the Budapest University of Technology and Economics) (Galuska et al. [1999], Szabó Tibor et al. [2000], Molnár et al. [2001], Hajdú et al. [2002], Hajdú et al. [2003], Hajdú et al. [2004])



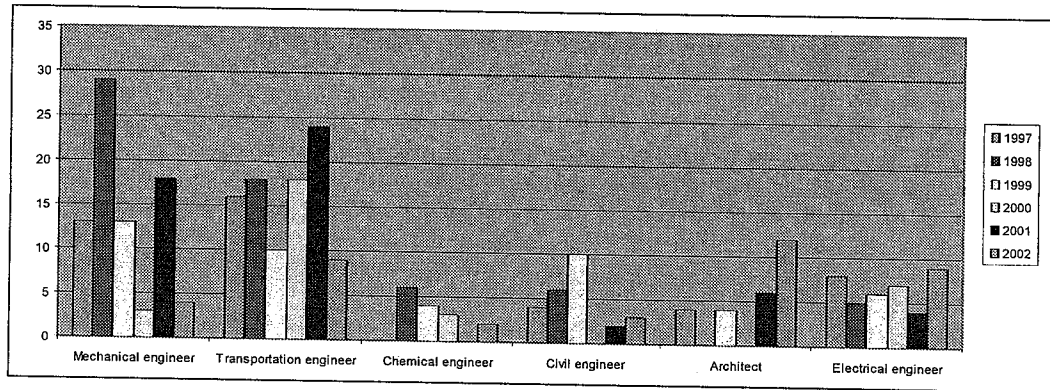


Fig.2: Definition of financial, legal and communication knowledge material as strength at the various faculties (%)  
Source: BME Students' Center

opposite direction), while at the Faculties of Chemical, Electrical, Civil Engineering and Architecture, rate of favourable opinion is low (below 10%) in all years examined. Reason of this difference between faculties is presumably that teaching of management subjects at the Faculties of Mechanical and Transportation Engineering has a larger tra-

dition and rate – as it reveals from the historical summary in Section I. Results of financial, legal and communication subject matters at the various faculties are demonstrated in Fig. 2:

All in all, we can state that training in business subjects does not belong to strengths of the University in the opinion of the students

Number of full time PhD students (persons)	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
BME	546	563	552	481	508	508	541	777	795	802	875	841
GTK	0	0	0	0	0	14	18	98	125	152	174	170

Table 1: Number of full-time PhD students

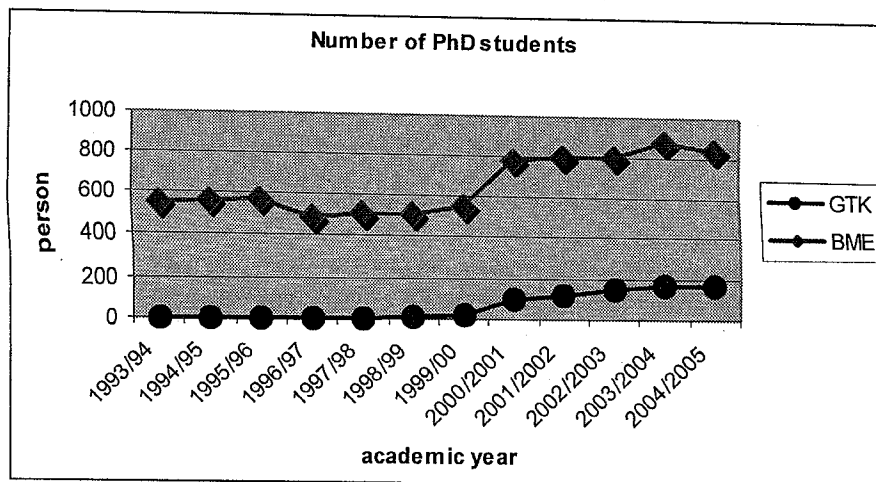


Fig.3: Number of full-time PhD students  
Source: BME Rector's Office, Scientific Administration

Number of full-time PhD students (persons)	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
BME	546	563	552	481	508	508	541	777	795	802	875	841
GTK	0	0	0	0	0	14	18	98	125	152	174	170

Table 2 and Fig. 4: PhD students per lecturer at GTK  
Source: BME Economic and Technical Chief Administration

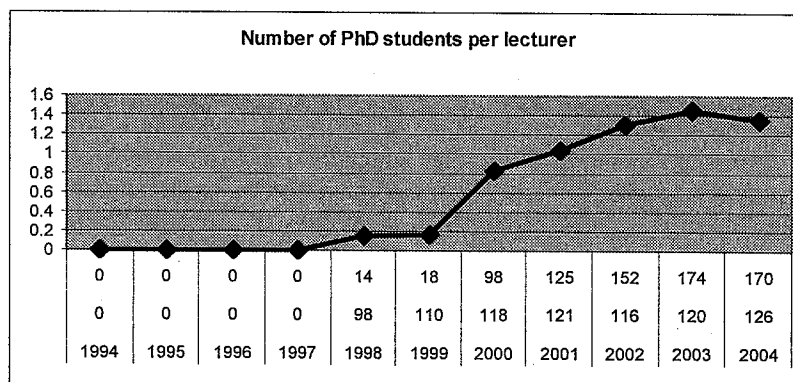


Table 1: Number of full-time PhD students

of the graduate courses. Let us compare this not too positive opinion with the high revenues from postgraduate business trainings, taking also the fact into consideration that out of postgraduate business trainings offered in Hungary the ones organized by the University are the most popular. This apparent contradiction has presumably a double reason, and is similar both on the part of the lecturers and students: Neither students nor lecturers participate in the state-financed trainings so intensely than in the separate and highly paid (charged) courses. Seemingly, intellectual capital of the faculty is within the traditional public servant circumstances partly dead, but – under market conditions – can be well managed.

### 3.3. Elements of the knowledge capital that can be described by natural key figures

In his approach we examine the change of students' number participating in PhD courses in economic and business sciences –

in relation to the complete set. We have chosen change of number of PhD students as a key figure because:

- these students intensely participate in producing and transferring new knowledge, they are major players both in research and education,
- in the case of these students participating in the education against cost reimbursement the faculties decide freely about the admission and the amount to be paid, and no law or other rule limits their number.
- these students constitute the most important basis for future researchers and lecturers.

In Table 1 number of full-time PhD students at BME and GTK is displayed in function of time. Comparing PhD students' number at BME and GTK we can see that the trend of change is the same in both probes. It reveals that GTK follows the PhD policy of the other seven faculties, organizes its scientific further education based on similar principles.

Analysing the number of PhD students per employee at the Faculty (*Table 2 and Fig. 4*) we can observe that both key figures move roughly together: after a dynamic growth the rate seems to become constant.

We hardly can draw any conclusion concerning the intellectual capital of the faculty from these data, the effect of involvement of PhD students (freshmen) in high numbers on the managed knowledge of the organization is not clear. We do not know either whether the increasing age (growing experience) of persons employed in public servant relationship, seniority encouraged by the organization can be deployed as relevant data, a key figure among non-financial measures. Trend of number of PhD students does not show any correlation with any other – natural, self-appraisal based or financial – measures either. Young employees with up-to-date knowledge may transfer better and more useful knowledge than their elderly colleagues do, however, the case is often the opposite. Our considerations are the same in the case of research too, as it is obvious that connections of the higher-ranked elderly colleagues are inevitable in raising funds for research, even if it is the young PhD staff that actively participates in research projects. Considering the low number of PhD degrees issued to full-time PhD students directly at the end of the training (in total three over ten years), the faculty seems to regard PhD students – in accordance with the rules of the self-directing authoritative organizations – as its (low-status) employees rather than customers purchasing services, having a special knowledge and wanting to enhance this knowledge. (However, because of the paradox of the problem customer–employee formulated earlier – for state universities –, PhD students become gradually customers this way.) Number of full-time PhD students seems to come to a stable level, and we expect that in the following some years it will turn out whether students – considered in most cases employees – have enriched the intellectual capital of the organization (faculty, university) or merely decreased the working time of researchers and lecturers employed as public servants.

## SUMMARY

In our paper we have studied the effect of business programs on the organization and operation of the University (of Technology). We have come to the following statements during our examinations:

The Budapest University of Technology and Economics in its history has always paid a great attention to – with the modern term – business trainings, to their management. **Except for the short state-socialist (communist) period, it has continuously developed its research (development) and education programs in the fields of economics, management and organization sciences, its relevant intellectual capital.** After the system change, this development has been accelerated; curricula of the business trainings have organically been integrated in engineering training. In parallel, multidisciplinary courses (like engineering management) have been launched; postgraduate business trainings are more popular than ever.

We described in detail the methods for measuring intellectual capital and discussed characteristics relevant for state universities. In our opinion, measurement methods developed for market organizations cannot be automatically adapted due to the specific operational features of state universities. **Our most important statement is that a state university directed and partly owned by the employees is not necessarily interested in managing the organization's knowledge, employees are often able to satisfy the target function of the organization (maximize their wage-type benefits) also in another way.** Based on this we developed a system of key figures that can be used if the university (universities) is (are) regarded as a competing capitalist company. Following up and evaluating the relevant key figures and their specific trend we can define the changes in the intellectual capital of the university, detect the drivers and predict future events.

Using some methods applied for measuring knowledge capital we tried to analyse the effects of business trainings. Within it we attempted to define the effect of business trainings – actually, the effect of appearance

of the Faculty of Economic and Social Sciences – on the intellectual capital of the University

- in terms of expenditures and utilization,
- by self-appraisal methods, and
- by the method of capital elements that can be described by natural key figures.

We have come to the conclusion that the intellectual capital available at the Faculty is managed effectively as compared to the other faculties – in the training industry. Even though we have stated that in the state-financed programs there are still great opportunities for utilization of this knowledge capital. It is worth mentioning that the selected element of knowledge capital that can be described by natural key figures did not prove; we could not decide whether the number and share of PhD students is a relevant key figure for the (university's) intellectual capital.

## MEASURES RECOMMENDED FOR CHANGES OF INTELLECTUAL CAPITAL

### 1. General measures

#### 1.1. Key figures of human resources

- a) Average age of persons employed as lecturers or researchers [year]
- b) Average wages of persons employed as lecturers or researchers computed for full-time work [%]
- c) Country-level average wage in white-collar jobs

#### 1.2. Quality system:

- a) Average value in appraisals of lecturers by students [figure]
- b) Average monthly income of fresh graduates [HUF]

### 2. Measures of education

- a) Incomes from paid trainings [%]; Training revenues
- b) Number of students in English-language trainings [%]; Total number of students

c) Number of students in MSc and PhD (DLA) programs [%]; Total number of students

### 3. Measures of research – development – innovation

- a) Total revenues from EU layout programs, NKTH, NFT researches, OTKA applications [%]; Total revenues
- b) Number of PhD students supported by state [%]; Total number of PhD students
- c) Number of inventions and patents [pieces]

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# Quality Management Roleplay Simulation (Description and Knowledge)

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**ABSTRACT:** The paper presents a method for the acquirement of new knowledge and skills in both graduate and post-graduate engineering education by means of Quality Management Role-Play Simulation (QM-RPS). The substance of the method rests in team experimentation with a Quality Management System (QMS) model prepared in advance. A team consists of any participants of Life Long Education and Training (full time students or managers of organisations) being trained in quality management. Experimentation may be applied to any of organizational characteristics, strategies, policies and quality objectives, the selection of the quality management system model, managerial roles, and all quality management activities. The results of experiments are recorded in pre-printed forms. The final solution to the quality management role-play simulation can be achieved in a consensus among role-play participants on the basis of value analysis of submitted partial solutions. The paper is intended for all professionals who are concerned with the educational theory and/or methodology in the field of Quality Management Systems or their practical application.

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## 1. INTRODUCTION

Simulation of real situations has been with the humankind for ages. All conscious activities are first simulated in our brains and only then performed.

In recent years, simulation as advisable and purposeful experimenting with a model has found its fixed place in many fields and disciplines, the overview of which can be found in e.g. [Harrington, 1999]. Besides simulations in dynamic socio-eco-technical systems, simulation could be used also for people training. In a simulated, floating environment, a per-

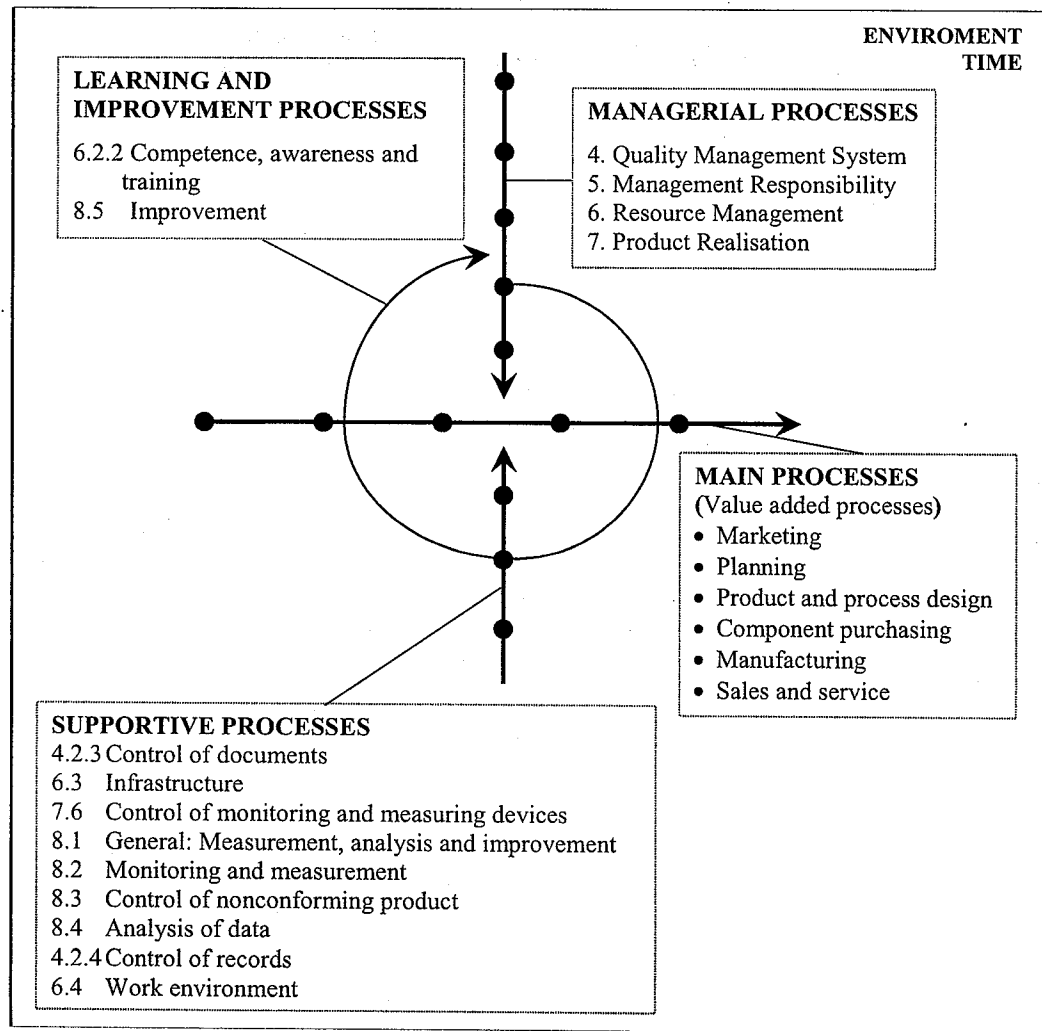
son acquires new skills and learns how to react to new situations. Such training is cost-effective and the experience can confirm its fruitfulness [Cadotte, Bruce, 2003; Houshyar, Nuila, 1998].

Use of online role-play simulation dates back to the early 1990s with the work of Andrew Vincent in Middle East politics used a makeshift application of email on a Unix system. In 1997, Albert Ip and Roni Linser started an implementation of a web-based fully integrated RPS environment, used as a tool for students to learn about world politics in courses in the Political Science Department

at the University of Melbourne. [Ip, Linse, Naidu, <http://ausweb.scu.edu.au/aw01/papers/referre/ip/paper.html>].

Simulation role-plays are currently widely employed, explored and the results are commonly published. One of the best-known journals in this field is a Simulation & Gam-

ing interdisciplinary journal of theory, practice and research in the area of increasingly popular methodology of simulation as used in education, training, consultation and research around the world. Among the recognized authors are: [Ip, 2003, Saunders, Cox, 1997; Reynolds, 1994; Van Mets, 1989; DeN-



*Fig. 1: The illustration of basic groups of processes that take place in any organization and their respective Quality Management activities numbered in compliance with ISO 9001:2000*

**ENVIRONMENT** – all important physical, social and economic factors with respect to a particular organization.

**TIME** – both in calendar and process duration senses of meaning.

eve, Heppner, 1997; Keane, 1998; Crostack, Reffinghaus, Schneider, 2002]. For example these works are dealing with simulation role-plays used in web environment: [Shank, 1997; Freeman, Capper, 1999; Ip, Linse, Naidu, 2002; Han, Ulrych, Votava, 2001; Piskurich, 2003].

The further development of this idea is the utilization of human activities in a simulated environment for its modification and creation of a new and better environment.

As a result, there are two facts:

- a new environment,
- new skills of a person in this environment.

Overcoming the resistance against change should be equally included among new skills. The resistance arises as a natural human reaction to change and often prevents the onset and exploitation of new methods and new tools [Reger, Gustafson, Demaire, Mullane, 1994; Mathews, Ueno, Pereira, Silva, Kekäle, Repka, 2001]. The involvement of an individual in a particular situation leads to such modification of the environment that it reflects actual abilities of the participants. This is useful in the further application of the system thus created.

At the Technical University at Košice, Slovakia, these issues have been dealt with both in theory and practice since 1987. QM-RPS has been applied in the education of courses covering the fields of Quality Management, Quality Engineering, Software Quality Engineering and New Product Development at the Technical University at Košice, Slovakia and the University of Vaasa, Finland since 1997. Results of our research were published: Zgodavova, K. 1992; Zgodavova, K. 1998; Zgodavova, K.; Slimak, I. 1998; Zgodavova, K.; Kosc, P.; Kekale, T. 2001; Zgodavová, Lengyel, 2002.

The QM-RPS method has been gradually assessed, adjusted and improved by the elimination of unsuitable procedures and the development of well-proven elements, until new approaches and the web-application have been introduced.

The paper briefly describes QM-RPS methodology, its implementation and the evaluation of the results achieved.

## 2. QM-RPS RESEARCH METHODOLOGY

QM-RPS methodology can be framed with several elements, such as:

- an entrance model of QMS of an organization,
- experimentation with the organization entrance model of QMS,
- a final model of QMS.

The content of such elements is affected by two kinds of factors:

- main characteristics concerning the organization for which QMS is being applied: type of organisation, organisation size and used management methods, strategy and policy of organisation, current achieved level of production quality, and achieved performance maturity level;
- requirements arising from the purpose of Quality Management Role-Play Simulation: training, design, diagnosing.

Some basic groups of processes that take place in any organization and fulfil the requirements specified above are illustrated in general in *Fig. 1*, presenting also all relevant quality management activities in accordance with ISO 9001:2000.

Role-Play Simulation as a system is shown in *Fig. 2*.

## 3. DESCRIPTION OF THE QM-RPS PROCESS

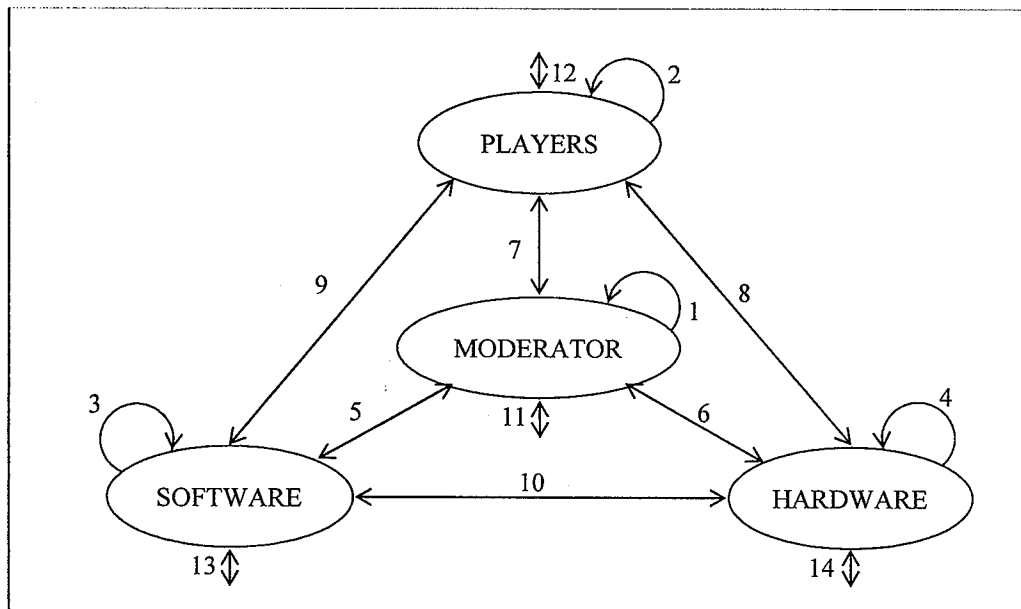
The objective of QM-RPS is to enable students as well as working managers and engineers to acquire necessary knowledge and skills in the field of quality management in a deeper form and shorter run than by any other educational method.

The objectives of QM-RPS ordered and arranged with respect to their complexity are as follows:

**T0:** To be able to define and select an appropriate entrance QM-RPS model.

**T1:** To understand and be able to describe briefly the QMS in accordance with ISO 9001:2000 and ISO 9004: 2000.

**T2:** To understand and be able to describe



*Fig. 2: Role-play simulation in Quality Management: elements and relations*

**Elements:**

- MODERATORS: teacher, trainer
- PLAYERS: students, managers, engineers, employees
- SOFTWARE: QM-RPS software, QMS models, QMS documentation
- HARDWARE: personal computers, intranet, internet and other help ware

**Relations:**

- 1,2,3,4 – memory information and self-assessment
- 5,6,7 – relationships of moderator/trainers to quality management system elements
- 8,9 – relationships of role-players/trainees to software, hardware, and vice versa
- 10 – mutual relations between system elements and the environment, time factors

the QMS and to be able to solve the outputs of the processes associated with the accepted managerial role in an organization.

**T3:** To acquire the knowledge according to T2 and; moreover, to be able to diagnose such knowledge, make adjustments and improve the processes associated with the accepted managerial role in an organization.

**T4:** To acquire the knowledge according to T3 and be able to apply such knowledge in the creation of quality manual – in the matrix of managerial processes and their performers.

**T5:** To acquire the knowledge according to

T4 and; moreover, to be able to apply a value analysis to the QMS: quality, efficiency and economical effectiveness of an organization.

**T6:** To acquire the knowledge according to T5 and; moreover, to have adequate expertise to participate in an internal QMS audit in accordance with ISO 19011:2002 and make use of an electronic tool for QMS audit.

QM-RPS process in its simplified form is demonstrated in *Fig. 3* with its three stages:

- selection of an appropriate entrance QMS model,

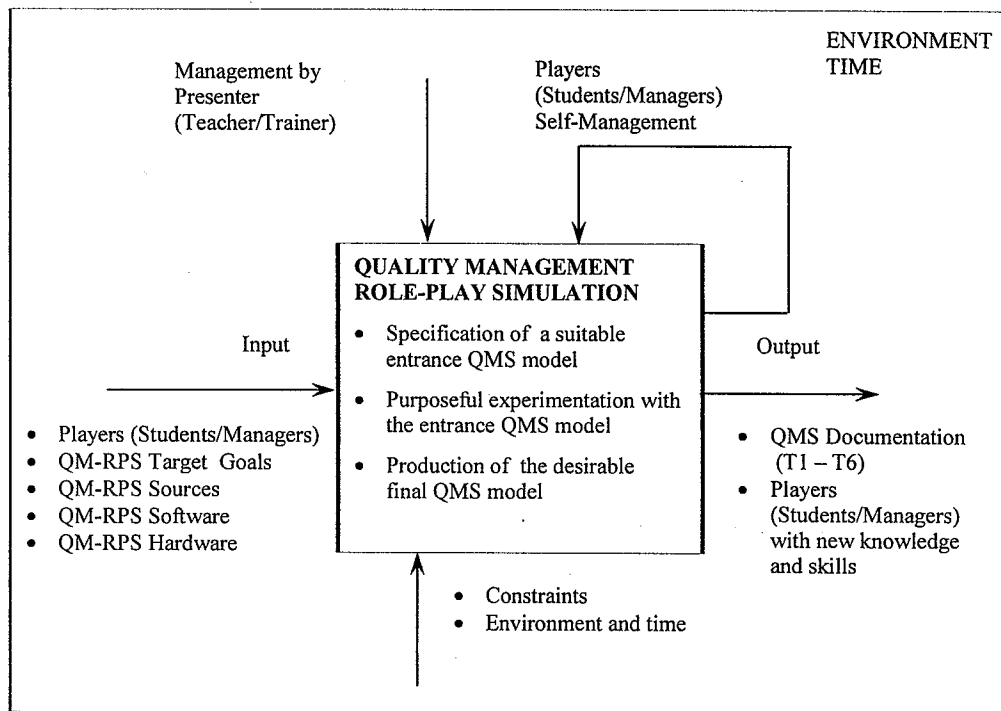


Fig. 3: Basic illustration of the QM-RPS process

- purposeful experimentation with the entrance QMS model.
- production of a desirable final QMS model.

To make the description shorter, Fig. 4 shows only the main groups of QM-RPS sub-processes.

**T0: Definition and selection of a suitable entrance QM-RPS model** is considered and marked as stage T0 and it consists of a complex group of sub-processes necessary to be performed in order to produce the documentation of the entrance QM-RPS model that shall further make it possible for the whole QM-RPS process to be put into practice. As the point of departure there is a goal that has to be achieved in a role-play, the type and structure of a particular organization, as well as the type and number of players – students/trainees or managers if the role-play is performed with professionals.

The documentation of an entrance QM-RPS model includes:

- the mission, vision, values, policy, and quality, efficiency and economical effectiveness objectives of an organization;
- a verbal description of processes at least at two or three decomposition levels in accordance with ISO 9001:2000, or, eventually, the use of EFQM (European Foundation for Quality Management) Excellence Model or Malcolm Baldrige National Quality Award (MBNQA) criteria;
- all necessary procedural documents and QMS records prepared in advance (according ISO 10013:2001);
- a list of quality management tools and methods with brief annotations;
- QM-RPS software documentation and, if necessary, also hardware specification;
- QM-RPS user manuals of the instructor/trainer and the players' moderator;
- specification of quality, efficiency and economical effectiveness objectives, required sources and their constraints.



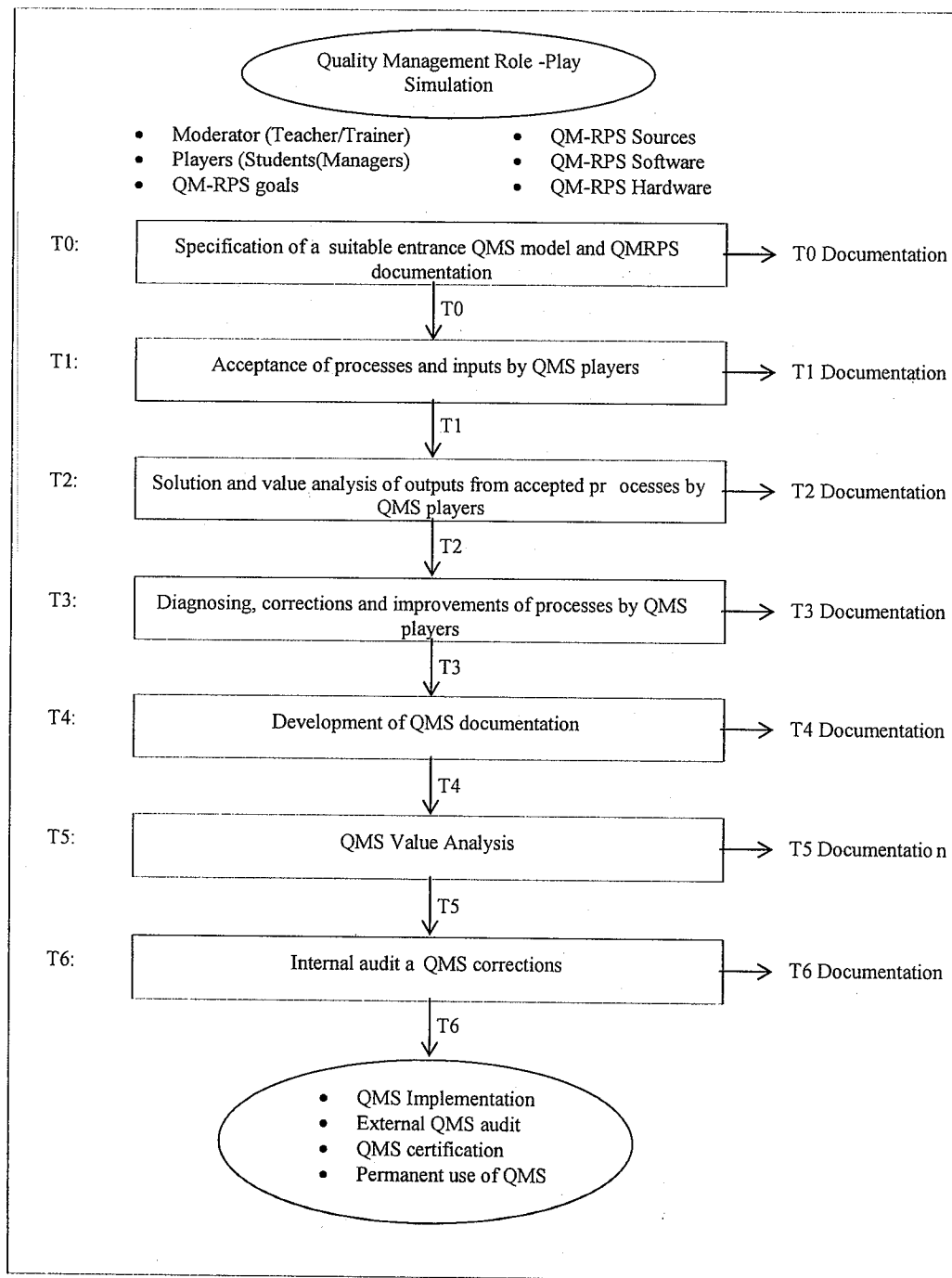


Fig. 4: The illustration of basic groups of QM-RPS sub-processes

Purposeful experimentation with the entrance QM-RPS model covers the groups of sub-processes listed from T1 to T6:

**T1: Acceptance of processes and inputs by the role-players** in a form of random distribution of documents of the entrance QM-RPS model T0 and their purposeful acceptance or refusal based on the players' opinions of their inappropriateness for their played or real professional managerial roles. Upon the general agreement between the players and the teacher/moderator, the refused processes and inputs are assigned to the players with the nearest professional managerial roles. The result is then the T1 documentation (Tab. 1) in a form of matrix, where the defined activities are matched with the partial activities – operations.

If the role-play aims to achieve the objective T1, i.e. to understand and briefly describe the QMS in accordance with ISO 9001:2000, the play has fulfilled its objective and is brought to its end. If all is planned well, this part of QM-RPS in a group of 8 students at the graduate level can be completed within 2 hours.

If the students are to continue in the role-play and master the next stage, i.e. the development or improvement of QMS in a selected virtual organization, it takes 10 to 18 hours to accept the process and input ownership (depending on the size of the organization and the abilities of players – students).

It takes 6 to 8 hours at the minimum to produce or improve the QMS in a real organization (depending on the size of the organization and the competence and motivation of managers).

**T2: Solution (process definition and process modelling) and value analysis of the output of accepted processes** present the most challenging part of the role-play as the players in order to produce the role-play output documentation must specify:

- the methods of solution,
- the content and the result of solution,
- the sources necessary for the solution to be arrived at,
- the costs of solution (taking into consideration the wages, material and the overheads of an organization).

When QM-RPS is applied in the process of

education, it must be sufficient to describe the QM-RPS process, specify the methods of solution and estimate the sources and costs.

When QM-RPS is used as an instrument for further improvements of the QMS in organizations, the task must be resolved by managers in close collaboration with their staff. The role-play is interrupted for a pre-set period and continues at the team levels; the teams formed by the managers after the QMS processes at the third and lower decomposition levels have been defined and modelled.

**T3: Diagnosing, correcting and improving QMS processes by the role-players** can be applied to all collected T2 documents, which may be a very lengthy process. It is important to start with such processes whose documentation requires the highest costs or is of greatest importance from the viewpoint of internal and external customers. It is an advantage if there is a procedure to be taken including the following questions:

- Is the process within the required specifications with respect to its quality, efficiency and economical effectiveness?
- What is the predominant cause of the fact that the process does not meet the accepted criteria: the method, implementation, people, material, or equipment...?
- How, by what means and costs should the process be improved and how long should it take?

Based on the answers to the abovementioned questions the T2 documentation should be adjusted and the processes improved.

**T4: The content of the quality documentation is defined in the ISO 10013:2001.**

In the QM-RPS in question the quality manual templates has been elaborated in advance and is only supplemented by the T3 documentation and the results achieved in purposeful simulation, such as:

- the names of managers and their professional roles,
- the matrix of quality management processes and the performers of assigned partial activities,
- quality policy and quality objectives,
- well-documented procedures,
- working instructions,

- forms,
- quality plans,
- specifications,
- external documents,
- records and data obtained through the filled-in forms.

The editorial revision, both technical and stylistic, of the quality manual should be mentioned separately.

#### **T5: Value Analysis of QMS**

The value analysis of the results of purposeful experimentation with the entrance model takes place in T2 and T3 QM-RPS processes. Based on the results a summary evaluation of the achievement of the role-play objectives and the assessment of costs of such achievement are carried out. It is desirable but also lucid if there is the specification of:

- total costs,
- the costs of groups of managerial activities under the headings of design, manufacturing, service and the evaluation of such groups of activities separately where necessary. This may reduce the possibility of unfavourable evaluation of higher costs of the managerial activity of minor importance.

QM-RPS should be used at least once a year and on the basis of the results achieved it should be improved. In the Quality Management Role-Play Simulation for educational purposes it is necessary to return to T1 or T2.

**T6: Internal audit and QMS corrections** are governed by ISO 19011:2002 and they present an extensive group of tasks in QM-RPS with thoroughly prepared procedures and their respective T6 documentation.

This is the final stage in the use of QM-RPS.

On the basis of the results of internal audit and after the removal of ascertained imperfections it is possible to apply for an external audit and certification. The certification authority shall specify the date of further auditing.

## **4. APPLICATION OF QM-RPS WEB-BASED KNOWLEDGE**

QM-RPS takes places in a web-based environment with client-server architecture. Players, a moderator, and an administrator

run personal computers as clients connected to the server. Moreover, the server and client computers are connected to the Internet or Intranet. The administrator is responsible for the QM-RPS system control; however, he remains out of play with no participation in it. The moderator is a teacher/trainer at the same time and is in control of the course events, watching the time and the acquirement of desired educational goals.

Goal-based scenarios [Schunk, 1997] provide an explicit account of instructional environments in which the learner is engaged in pursuing a goal, within a simulated environment, in order to master a set of target skills.

Players communicate with each other and with the moderator in order to achieve both the objectives at particular stages and the overall goal of the play. Players can take part in the play when they:

- accept a managerial position in an organisation,
- enter on the related quality management processes, their inputs and outputs,
- tackle the simulated situation in production quality of an organisation,
- accept their individual contributions to a particular situation in production quality,
- come up with reasonable and suitable measures that should be taken to improve the situation that has occurred in production quality.

Web-based software was developed in the PHP language. MySQL database was selected for data storage. The database contains:

- main situation types for QM-RPS in an organisation from the points of view of quality policy, efficiency, and effectiveness.
- main situation types in product quality from the technological, material, production and service-provision points of view.
- main situation types in production processes quality with respect to performance and qualitative capability.
- main managing activities for the detailed development and valuation of process importance in RPS (planning, organisation, leadership, and control).
- work sheets - play cards for the process definition in Quality Management Role Play

Simulation in compliance with ISO 9001, 9004:2000, The EFQM Excellence Model, and The MBQA National Quality Award Model. These should be partially completed by processes to be solved.

- blank graphical Quality Management models of process definitions for players to take notes.

- blank matrixes of Quality Management processes and managers participating in Role Play Simulation.

- the graphical model of main processes in the value chain and relevant activities or groups of activities that have to be performed by particular organisational posts or individuals – managers participating in Role Play Simulation.

Language versions of role-plays are recorded in the database, which enables various players to simultaneously take part in the play in various languages. As part of the play, there is a monolingual explanatory dictionary and a library of detailed information to facilitate the decision-making process of players.

The graphical model of Quality Management Role Play Simulation as the process of transformation of outputs into inputs, which is marked predominantly by new managerial skills and new management quality system documentation, is shown in Fig. 2.

The phases in Quality Management Role Play Simulation are as follows:

1<sup>st</sup> phase : Organisation Presentation (Fig. 5)

- Familiarization with an Organisation
- Finding the Right Places for the Right People

- Post Acceptance in an Organisation

2<sup>nd</sup> phase: Experimentation with the Processes of the QM System (Fig. 6)

- Selection from Randomly Distributed Processes

- Acceptance of Intentionally Assigned Processes

- Taking Responsibility for Processes

3<sup>rd</sup> phase: Experimentation with QM Process Inputs and Outputs (Fig. 7)

- Buying from Randomly Distributed Processes

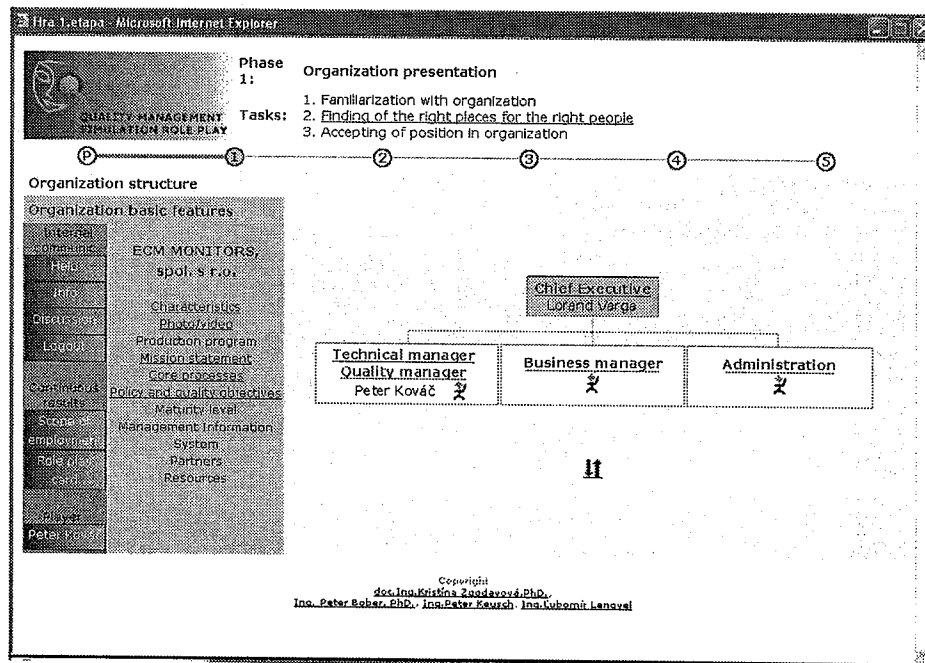


Fig. 5: Company presentation

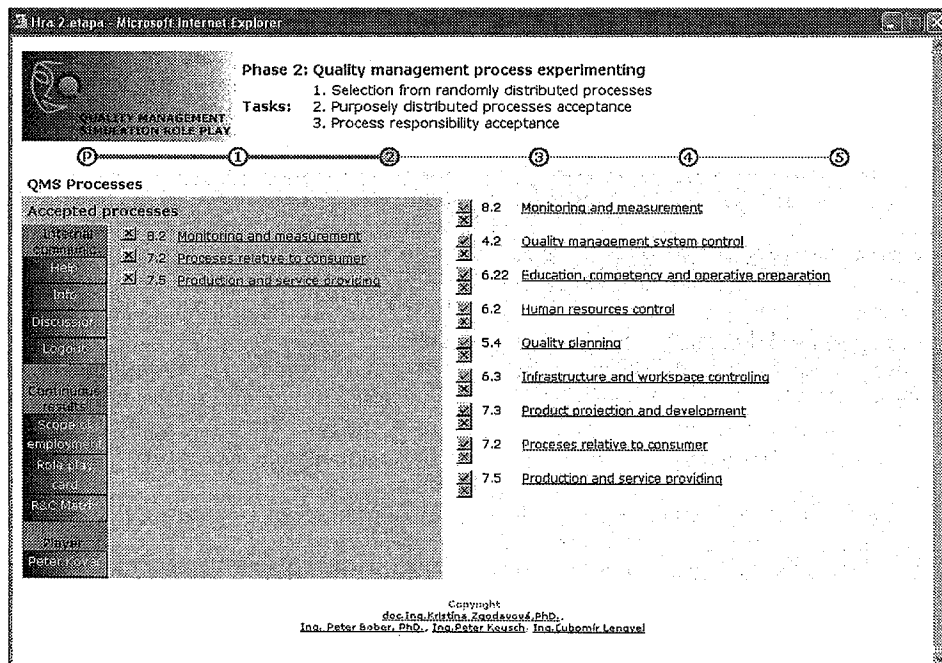


Fig. 6: Experimentation with Quality Management System processes

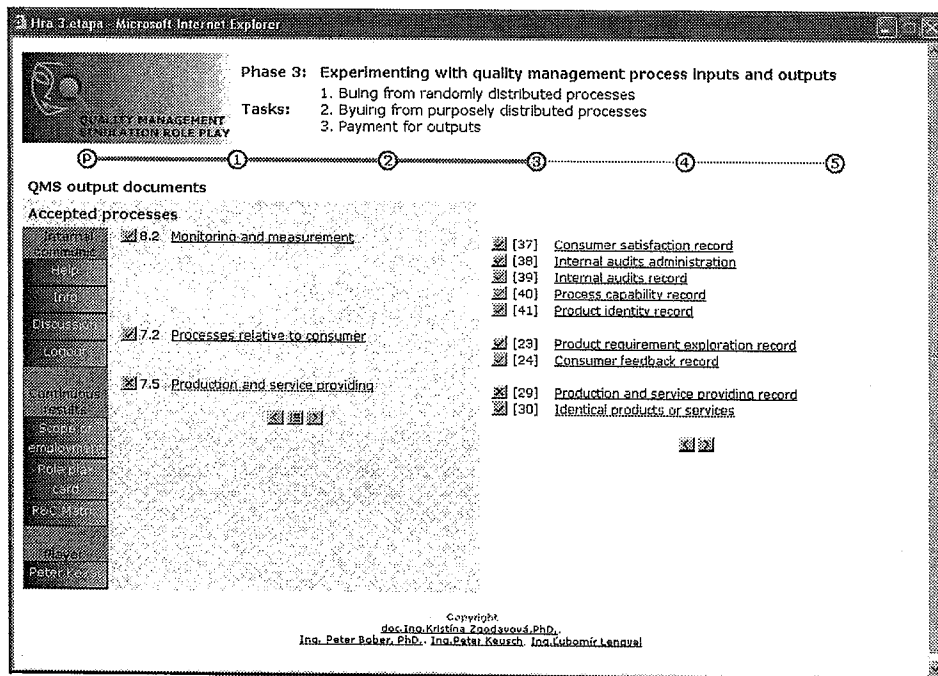


Fig. 7: Experimentation with inputs and outputs of Quality Management System processes

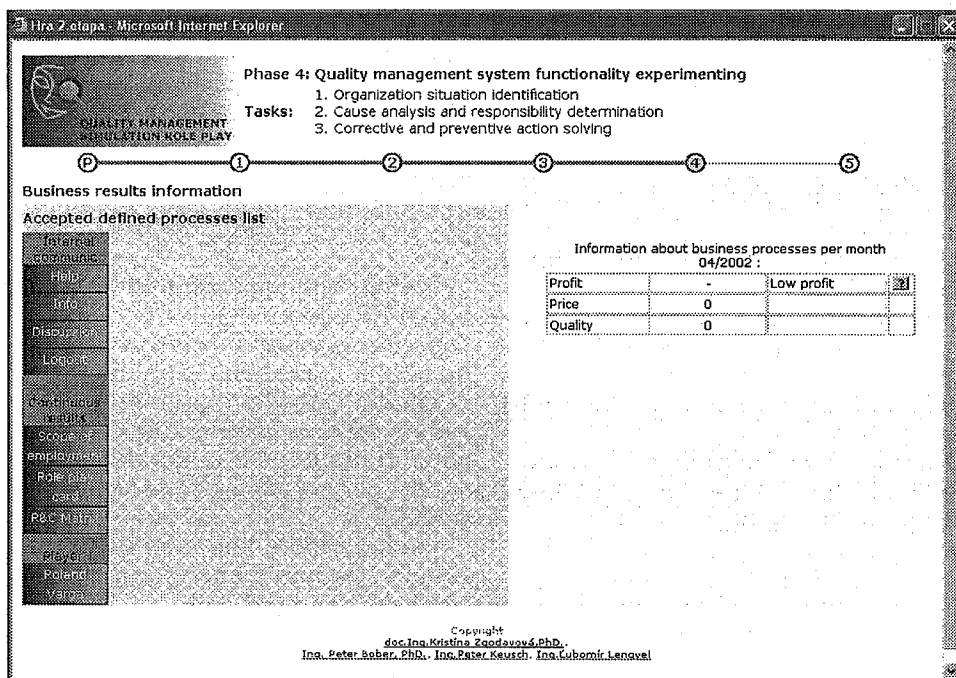


Fig. 8: Experimentation with Quality Management System functionality

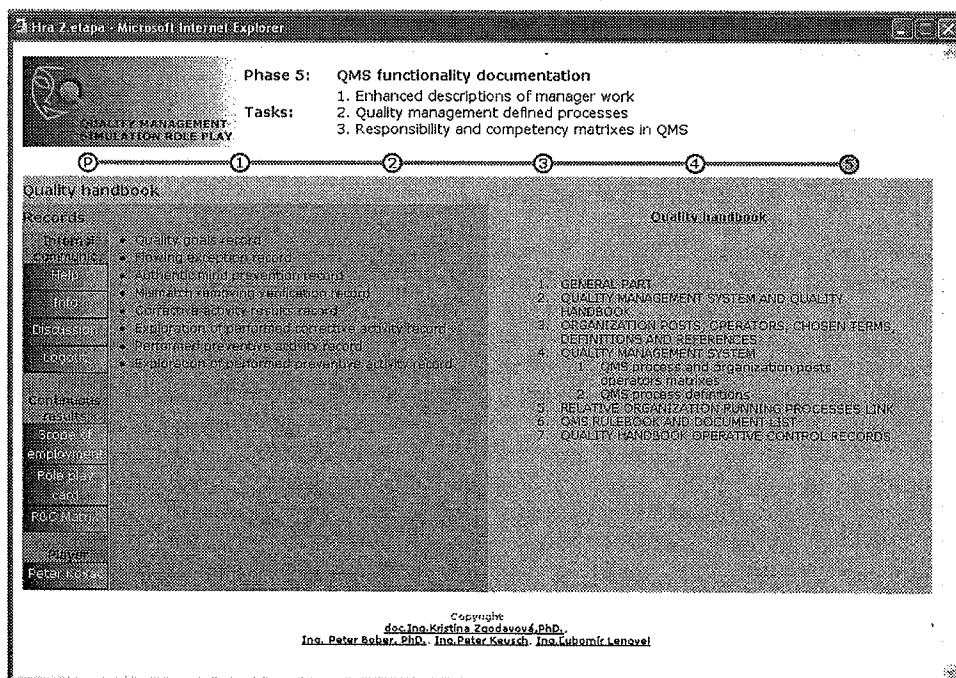


Fig. 9: Experimentation with Quality Management Systems process inputs and outputs



- Buying from Intentionally Distributed Processes
- Formulation of the Comparative Effective Value
- 4<sup>th</sup> phase: Experimentation with the Functioning of QMS (*Fig. 8*)
  - Identification of the Situation in an Organisation
  - Reason Analysis and the Determination of Responsibilities
  - Improvements and Prevention Measures
- 5<sup>th</sup> phase: Documentation of a New QM System (*Fig. 9*)
  - Enhanced Descriptions of Managerial Tasks
  - Defined Quality Management Processes
  - Responsibility and Competence Matrixes in the Quality Management System.

The knowledge acquired in the application of QM-RPS can be briefly summarized as follows:

- The better knowledge of modelling and simulation in general and of qualitative modelling [Kuipers, 1994; Golemanov, 2002] and simulation role-plays [Kuipers, 1994];, the easier and the more successful application of QMS, and vice versa. Therefore, it is desirable to place the quality management subject making use QM-RPS after such courses dealing with topics of modelling and simulation, managerial games, and quality management have been completed.
- The mission and objectives should be thought over and planned carefully and the objectives be formulated so that the application of QM-RPS could be justified and based on measurable results of the improvements in quality, efficiency and economical effectiveness of both products and processes.
- The entrance QMS model should be selected in the way that it contains variables enabling to achieve specific measurable objectives by means of purposeful experimentation in quality management role-play simulation.
- QM-RPS as a whole should make it possible for the balanced participation of both less and more capable manager-players in the design of the QMS for an organization main-

taining the principle: the right posts for the right people.

- QM-RPS should make it possible for one player to perform more than one managerial role.

## 5. CONCLUSION

The long-term application and development of QM-RPS have proved its high effectiveness both in educational processes and in the improvement of processes in organizations. The benefits of QM-RPS depend on a number of various reasons; however, the critical factors affecting its successful application are:

- the purposefulness of an entrance QMS model,
- competence and motivation of both moderators (teachers/trainers) and role-players (students/managers), and
- the quality of the software and hardware used.

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# The Special Needs of Developing Countries in the Field of Engineering Education

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Higher education, as well as primary and secondary education, nurtures educated human resources for development while functioning as a center for developing and transferring knowledge. It offers knowledge in professional fields such as law, medicine, and engineering. Higher education also nurtures policy makers and business managers. Thus, higher education plays an important role in the development process of all nations. Engineering has been one of the most important academic fields of higher education in both developed and developing countries because this field of study has always been expected to make a direct and significant contribution to their industrial advancement and economic development. However, economics of education studies found a somewhat contradictory and unexpected relationship between higher education and economic development. For example, the social rate of return to higher education is found to be less than that to primary education across nations and regions all over the world. (Psacharopoulos and Woodhall 1985, Psacharopoulos 1993, Psacharopoulos and Patrinos 2002) Also, a number of cross-national statistical studies using correlation and multiple regression to examine the effect of education (independent variable) on economic development (dependent variable)

have suggested that primary and secondary levels of education have a greater impact on economic development than higher education. Lee and Psacharopoulos (1979) included in their correlation analysis the average annual growth rate of the GNP and per capita income as economic performance indicators. They found that two indicators in particular — enrollment in vocational schools and the number of doctorates per 1,000 individuals — show very low correlation with national economic performance. On the other hand, two other indicators, enrollment in primary education and the literacy rate, are highly correlated with economic performance. Benavot (1989) found that primary education enrollment has a more significant impact on economic development than secondary education enrollment, and that higher education enrollment has a significantly negative impact.

This inefficiency of higher education for development can be partially attributed to its high cost structure. Wolff (1984) found that the average unit costs were more than 50 times higher for higher education than the average primary costs in Eastern Africa. The reasons for this high unit cost vary. Wolf identified that (1) the student/teacher ratio in higher education is much lower than that in

primary and secondary education; (2) the share of the non-teaching cost for higher education is more than 50%, while most of the cost for primary education comes from teacher's salaries; (3) the teaching time of the staff in higher education is significantly less than that in primary and secondary education; and that (4) the physical equipment in higher education is costly and significantly underutilized (*ibid.*). Although this does not explain the cost factor for engineering education specifically, it can be easily expected that engineering is a more costly field than other fields of study in higher education.

The inefficiency of higher education can also be seen in the high unemployment rate among graduates of higher education in some of the developing countries. This phenomenon seriously challenges the belief that higher education contributes to economic development. There are several possible reasons for this discrepancy. One explanation is that higher education has expanded too much in some developing countries and their economies simply cannot absorb so much high-level manpower. Second, even in countries that need more high-level manpower, many higher educational institutions have not correctly determined the needs of the market and have not nurtured employable manpower. Third, higher education tends to give students higher expectations for their future jobs. Some highly educated people do not take jobs below what they expect even if the jobs are available. The high unemployment rate of well-educated personnel is a clear indication of the lower efficiency of higher education.

Brain drain is another obvious factor contributing to the inefficiency of higher education investment in developing countries. University graduates in developing countries, especially in the fields of engineering and science, tend to seek job opportunities in developed countries where they can earn a much higher income than in their home countries. This tendency also makes higher education in developing countries less efficient for their own economic development. Highly skilled

individuals have migrated throughout history, but this problem first received attention in the 1960s when the United States started to promote science and technology after the „Sputnik Shock.” The policy increased the inflow of foreign scientists and engineers to the U.S. The immigration of highly skilled individuals from developing countries to Western Europe and to multilateral organizations also increased during the 1970s (Grubel 1977). At that time, developing countries were starting their efforts to industrialize their economies. Emigration of scientists and engineers was certainly an obstacle. Now, as the labor market becomes more global, many advanced countries are competing to attract well trained foreign professionals in technology related areas by adjusting their immigration policies. World Bank (2002) estimated that more than 40% of the graduates of the Indian Institute of Technology (one of the most established higher educational institutions in developing countries) seek employment abroad, and that approximately 30,000 Africans holding Ph.D.s live outside of Africa. Indeed brain drain can be a great challenge for investment in higher education in developing countries and their national development as a whole.

These findings and criticisms of higher education in developing countries have presented justifications for the „Education for All (EFA)” movement in 1990's, which shifted the focus of investment from higher education to primary education in international assistance and domestic budget allocation in many developing countries. The strong argument for „basic education as a human right” also supported this shift. In the 1980's and 90's, higher education, including engineering education, in developing countries, especially the least developed countries in Africa, fell into crisis because of this changing pattern of funding allocation to higher education.

However, the growing knowledge economy started to receive new attention in the international community in the late 1990's because of the information technology revolution. The World Conference on Higher

Education was held by UNESCO in 1998 and was attended by many other international donors as well as representatives from developing countries. Since this conference, there has been a reemphasis on the importance of higher education in development. In 2000, the World Bank and UNESCO jointly organized the Task Force on Higher Education in Developing Countries and Society and published the joint report, „Higher Education in Developing Countries –Peril and Promise.” According to the report, „The world economy is changing as knowledge supplants physical capital as the source of present (and future) wealth. Technology is driving much of this process, with information technology, biotechnology, and other innovations leading to remarkable changes in the way we live and work” and criticize „Narrow –and, in our view, misleading – economic analysis” which „has contributed to the view that public investment in universities and colleges brings meager returns.” Indeed, India, for example, used to be criticized by economists for her „over” investment in higher education, but now it is the graduates of this „over” invested higher education who lead the growing economy of this country.

Recognizing the importance of higher education in developing countries, several directions have been suggested for the development of this sector by the international community. The first dimension to address is the cost of higher education. One of most effective ideas is to introduce or increase students' tuition fees. This market oriented policy is expected to also have a positive impact on motivating students to earn degrees within a shorter term and improve the quality of instruction. However, excessive cost sharing with students may damage equity in some fields of study which have a relatively higher unit cost. To introduce a cost-sharing policy with students, universities and governments should prepare sound scholarship and student loan systems for poor students. Also, governments should make a special allocation of their budget to costly and strategically important fields of study, such as engineering, to reduce the students' financial burden.

Another suggested strategy is the introduction of competitive and quality output-based funding by governments to replace input-based funding for higher educational institutions. It emphasizes the importance of an incentive structure, which recognizes the number of graduates and the quality of education and research rather than just student intake. For example, the World Bank regards their experiences in competitive proposal-based funding to higher education institutions in Brazil, China, Korea, Hungary, Egypt and Indonesia as being quite successful, and they have suggested to give „...increasing priority to investments designed to enhance the quality of instruction and research”. (World Bank 1994, 89p) Funding should be sought not only from the government but also from the private sector. Building up external linkages is particularly important and feasible for the field of engineering to enhance collaborative curriculum development, training courses, collaborative research programs, consultancies, and science parks. The private sector external linkages contribute not only to raising funds for higher education but also to adjusting higher education for the practical needs of societies and economies, as well as linking higher education with the socio-economic development of developing countries.

Diversification of higher education is also often a suggested strategy. In particular, this direction emphasizes developing non-university institutions such as polytechnics, short-cycle professional and technical institutes, and community colleges because these tend to be more flexible in responding to labor market needs. The World Bank (1994, 32p) explained that, „In the engineering field, a new distinction has appeared between 'engineering scientists' and 'applied engineers.' The former are involved in more analytical and abstract work, whereas jobs filled by the latter on production processes.” The Bank stressed the necessity of establishing an appropriate system to nurture „applied engineers” using Singapore and Mexico as examples of successful cases. The Bank also argues that, „Non-university institutions help meet

the demand for improved access to higher education by minority groups and underprivileged students."

Globalization presents threats to higher education and development in developing countries, such as brain drain, but it also presents opportunities. One of the directions which utilize these opportunities fully is regional cooperation among small developing countries that cannot afford to have all the types of higher education in one country. For example, the University of the South Pacific and the Universities of the West Indies have been regarded as successful cases of overcoming the size problem for higher education. Another example is the World Bank sponsored African Virtual University (AVU), a satellite-based education system targeting post-secondary students throughout Sub-Saharan Africa. At present, 22 Anglophone and Francophone universities in 16 African countries are AVU participants. Participants can access the AVU digital library and download information at no charge during an initial trial period and at an annual flat rate in the future, thus sharing data and costs (Milton, 1997). Joint venture higher education programs between developing and developed countries are also rapidly increasing. The National University of Singapore established a joint master program in engineering with the Massachusetts Institute of Technology utilizing videoconferencing systems. Beijing University in China and Waseda University in Japan have also recently launched joint degree programs. To support and enhance this kind of direction, legal and practical systems for the international recognition of qualifications should be constructed.

The development of higher engineering education requires a very stringent set of conditions for it to work successfully in developing countries. However, in order to keep pace with the rapidly changing knowledge society, developing countries are required to put much effort into enhancing their higher engineering education in order to be competitive in an information-based, technology-driven, globalizing world. There are significant steps that governments can take to foster and encourage

the right environment for higher engineering education. The poorer the country, the more focused its efforts to support engineering education will need to be to achieve carefully-thought developmental goals.

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# Fundamentals of Management for Engineers

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**ABSTRACT:** Management requires a very broad and complex variety of knowledge. Some of these elements, such as project planning, project management and their software are typically present in the university curricula. Engineers, however, also need some basic knowledge and understanding of law, finance, accounting, marketing, etc., which are usually not on offer at technical universities. Young engineers meet labour law from the very first days of their professional lives. Working as an employee at a company, or funding a small company or a spin-off, our engineer faces problems of taxation, costing of a contract or an offer, cash-flow, and many other everyday tasks. Most of these will be attended to by specialists but they and the engineers, who in most cases bear the responsibility of the final decision-making, should find a common language and wherever possible understand each other.

This paper outlines the basic points of a short course in management for PhD students, compiled by the author.

**KEYWORDS:** MANAGEMENT, SPECIAL COURSE

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In the course of daily engineering work, in addition to professional skill, experience in business, law and finance is becoming ever more important. One of the reasons for this is mobility: the number of engineers entering into ventures at various stages of their careers is growing, as is the number of those becoming entrepreneurs through choice or necessity, either as a main trade or to supplement earnings. Any mistakes made in bookkeeping, taxation or customs formalities may prove costly. It is therefore advisable to keep a check on the bookkeeper. Borrowing and capital investment may be necessary, and business plans, cash-flow plans and other documents have to

be prepared. In addition to this, a basic knowledge of law and finance is indispensable to experts working for firms, universities or research institutes. Over and above professional expertise, a considerable amount of legal and financial experience is required in the expanding area of financing through tenders, tendering, public procurement, contracting and labour contracts. Naturally, finalisation must be done in co-operation with financial and legal experts but, in the interests of avoiding communication problems, familiarity with the concepts is an absolute prerequisite.

Lastly, there are more and more new concepts in the private sector, in our daily rou-



tine. It is advisable not to make mistakes in tax returns, to understand the conditions and charges involved with different types of credit and to be able to choose the best investment options. All this knowledge can, naturally, be acquired as you go along. In fact, this is how most of it is learned by everyone. Education should focus on systematically familiarising engineers with the basics.

The course material detailed below is for PhD students. The course comprises two lectures a week for one term.

Lectures:

- The Fundamentals of Law: 3x2 lectures
- Basic Finance: 2x2 lectures
- Financial Accounting: 2x2 lectures
- Fundamentals of Foreign Trade:

1x2 lectures

- Management Practice (management accounting, capital investment, business planning): 3x2 lectures

Total: 11x2 lectures

Naturally, the topics bear the marks of compromise. Management generally involves marketing, company organisation, product management – life cycle – product portfolio, project management and quality assurance, the basics of human management and fundamentals of economics. Due to its timeliness in Hungary it is worth mentioning state finance (state budget, GDP, balance of foreign trade, exchange-rate policy, control of money supply, etc.). There are also many other important topics, such as tender systems, public procurement and similar issues, since second line managers or entrepreneurs regularly meet all these in their daily practice.

The Fundamentals of Law starts with the Contract Law of the Civil Code. This section deals with contracts types, formal and content elements, entering into a contract, performance, modification, violation, termination, etc. of a contract and the legal consequences of the same. Students learn about the concepts of liability, guarantee and warranty.

The next chapter is Company Law. The focus will be on basic terms and processes

(general provisions, common rules, forms of companies and specific rules) but mention will also be made of organisations regulated in the Civil Code (civil law association, foundation, public funds, etc.), governmental companies, co-operative and budgetary institutions. The different forms of closing-down of companies, bankruptcy, dissolution and full settlement will also be referred to.

The next important area is labour law, primarily the Code of Labour Legislation. The specific features of the Code of State Employees and the Code of Civil Servants will be covered.

The last important legal rule section deals with government revenues. The most important types of tax will be outlined, such as value-added tax, corporation tax, personal income tax and local tax, as well as the essential elements of the Tax Code and Duty Tax Code. We shall deal with the social insurance system, the different payments, the important forms of the provision of health insurance and the Pension Code, together with the essential pension reform changes coming into force in 2013.

Basic Finance deals with cash terms, such as the time value of cash, the fundamentals of monetary policy, its system of implements and institutions. In relation to the banking system, terms such as banking services (credit, factoring, discounting of bills, leasing, bank guarantee) will be discussed, and also the practice of cash-flow transactions (bank account, transfer, collection, letter of credit, clearing system).

The next topic comprises the basic concepts of securities and the Stock Exchange. The concept of securities and the types, the questions of return, exchange rate, pricing of fixed and floating-rate securities and shares will be discussed. In relation to the Stock Exchange, in addition to the basic concepts, important Stock Exchange transactions (spot-exchange and forward transactions, options), Stock Exchange price indices and derived Stock Exchange products will be dealt with.

In connection with further investment opportunities, different investment funds, venture capital funds, pension funds and different life-insurance structures will be discussed.

Financial Accounting will start with an introduction to accountancy. This will be based on the Accountancy Law. Single and double-entry accountancy, the principles of accounts, ledgers, the chart of accounts and balance sheets will be illustrated through some elementary transactions. Revenues, expenses, depreciation, profit before tax, profit after tax and dividends will be discussed through the income statement.

After the basic terms, annual company reports and analysis will be discussed. The types, structure and content of balance sheets and income statements will be surveyed, including business reports, supplementary annex, auditor reports and clauses, as part of annual reports. The consolidation process and principles of the consolidated report will be mentioned. The most widely used methods of analysing annual reports and the different ratios will be discussed.

The next topic is the financing of a company. Issues such as the elements of the owners' equity of the company and their returns, elements of liabilities and their price, the optimal proportion between them, long-term investments and operating assets, the concept of cash-flow, cash-turnover, and other ratios will be addressed.

Fundamentals of Foreign Trade points out the special features of foreign trade transactions. Some basic terms (such as currency, foreign exchange, exchange rates, convertibility) and problems specific to foreign-trade contracts will be characterised. Greater foresight (acquisition of information on the firm and the bank, studying the differing legal rules in the partner country), selecting payment methods, considering and weighing up the risks accordingly and the methods of diminishing the same will be discussed. Contracts must definitely include issues of the

official language, the legal rules to be observed and the competent court, all of which may have significant advantages or disadvantages.

Delivery-related matters (terms and methods of delivery and shipping documents), insurance and payment technicalities applied in foreign-trade transactions (mainly different letters of credit, documentary collection, the role of banks in foreign-trade clearings) will be dealt with briefly.

The last topic is Management Practice. Two subjects will be focused on in the lectures: management accounting and business plans.

Management Accounting deals with the cost structure and capital structure of a company, their effect on company results, with the behaviour of costs and product costing. In the field of liquidity management, cash-flow planning (cash receipt and cash outflow) and preparing and analysing cash-flow reports will be discussed. This will be followed by the means of liquidity management: profit-management, the legal means of deferring payments, the efficiency rates of liquidity management, and the means for stabilising the cash status (credit, capital investment). Long-term decisions on production and expansion, investments and the financing of the growth fall within this sphere. The impact of the intended investment on the realisation (replacement, expansion, new products, cost reduction), the initially invested capital and the stream of future outflows, the sources of funding (equity, credit, etc.), the sources of return and the return period must be specified. The risks and guarantees must be weighed up. The comparison of investment costs and returns is an essential step, since in most cases one may choose from among several investment alternatives. To this end the RRR and IRR rates will be discussed.

Business plans are becoming more and more essential to a venture. Content and structure are based on fairly widely accepted use. Business plans are required by propri-

etors and potential investors, and are indispensable when it comes to credit procedures and capital investments. Business plans contain at least a description of the firm, product structure and market, as well as the strategic concepts and the basis for them, financial analysis of previous and future years, the inventory level and SWOT analysis.

Finally, the concepts specific to R+D management will be discussed. We shall deal with the R+D financing system, national and EU tenders and R+D tax allowances, and there will also be a short introduction to the Law of Innovation, copyright protection and Law of Venture Capital.

## METHODOLOGY

Concepts related to the material tend to be unfamiliar to engineers. Their knowledge regarding legal issues, systematised to a certain extent, may be considered minimal. They have already met the majority of terms and concepts in connection with other topics but have problems with the precise contents. When asked very simple questions, like what currency and foreign exchanges are, or when one should use the buying rate or selling rate, accurate answers are seldom forthcoming.

I prefer the learning process to take place through the examination of actual cases, and the field of finance offers very many opportunities for this. We shall, for example, work out constructions for housing or car loans and futures and options exchange transactions, but unusual cases may also be found in connection with various legal issues. Accounting, the concept of accounts and balance sheets are all extremely clear and simple on a basic level – book-keeping is made complicated by the numerous special rules and formalities. It is worth preparing and presenting simple examples – naturally the time limit allows only very modest demonstrations. Issues concerning company funding can also be illustrated simply, and we may as well also discuss „fashionable” concepts such as sustainable growth.

The comparative introduction of different concepts is an extremely useful method. For example, what is the difference between a limited company and a joint stock company (Inc.), which form should be chosen and when? A parallel presentation can be made to show the advantages, disadvantages and costs of borrowing and capital increase.

## PAST EXPERIENCE

In past years, of the facultative subjects offered to PhD students, the Fundamentals of Management has had the highest applicant rate. Students are particularly interested in topics they have already met in practice, and ask many practical questions. In connection with law there is great interest in contracts, company law and taxes. Basic financial terms, securities, Stock Exchange and investments are also areas of interest – to people as private individuals too. Most of the PhD students, in their capacity as individual entrepreneurs or owners of a limited partnership or limited company, have already come across accounting, and often inquire about the details. Participants find the foreign-trade terms interesting, since this area is completely new to them. The problems of business planning are challenging because many of the students have already learned about them and are fully aware of their importance but do not know how to compile a business plan. I have noticed at my Institute, for example, that not even the extremely simplified financial plans related to tenders are realistic, and borrowing requires significantly more than that.

# Evaluation of Training Effectiveness

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First it is necessary to explain why it is not general education but training effectiveness that is going to be dealt with in the following paper. Training is used by the standard (ISO 9000:2000) in the context of professional ability (as a proved ability to apply knowledge and skills).

Training effectiveness is a degree of objectives which should be achieved by means of training. It can be expressed by an indicator ratio, i.e. the determined state after training towards the previously set basis. The basis represents an ideal state which should be achieved through training.

$$Ef(T) = \frac{Rs}{Is} \text{ [body, coefficient, CZK]}$$

$Ef(T)$  – training effectiveness  
 $Rs$  – real achieved state  
 $Is$  – ideal expected state

As the total effectiveness is influenced by more factors, the evaluation of training effectiveness is in fact an analysis of all the partial factors. The summary formulation of effectiveness may not have such an informative ability to allow us to accept further measures, standpoints, or an action plan for further development. For operational reasons it is

important to deal with partial factors and their assets to effectiveness. It is then possible to talk about the evaluation.

$$Rs = Ep \times Tt \times Cf \times Ep \times Pp \times Op$$

$Ep$  – Employee's potential  
 $Tt$  – Training timing  
 $Cf$  – Corresponding form and content for application  
 $Ep$  – Employee's performance  
 $Pp$  – Process performance  
 $Op$  – Organisation performance

Efficiency of training is a different topic and will not be dealt with in this paper. It is rightful to expect that high effectiveness is connected with high efficiency, which is usually the case. However, it is necessary to point out that high effectiveness of training may not result in efficiency of training process or efficient process may not be effective.

## PURPOSE OF TRAINING PROCESS – FOR WHOM AND WHAT

Implementing the training process into the „everyday” life of a company is not a casual or routine process. It has to follow and it follows the main strategic target: to strengthen the

company's competitiveness. To make the notion 'competitiveness' easier, we will follow one of its attributes, i.e. efficiency. Efficiency can be expressed in both financial and non-financial indicators but always in the following hierarchy: individual, process, and organisation efficiency.

### **AIM 1: EFFICIENCY**

An organisation aims at an important position on the market, creating future sources of prosperity, and high efficiency at present. Any investment is efficient provided the organisation strengthens any of these aspects. If not it is a risky investment which may or may not develop. Investment in knowledge of people becomes risky in case of a dubious aim which is to be achieved possibly through training. Therefore, it is not a coincidence that Europe is coming to be „reigned” by the phenomenon called „investors in people” which has been put into a model scheme – at present known either as British or Irish.

The question is: „What is the purpose of the training process – for whom and what?” It can be agreed that based on the above mentioned information, the training process is to serve an organisation and mainly its efficiency. Also, this will be without exceptions the case for the health care sector.

### **SOCIAL ASPECT**

The pressure of an owner or a company management on efficiency can be considered as rightful and quite logical. Therefore there is no doubt that the foremost aim of training is efficiency. In other words how training can help to achieve efficiency and what it can bring for further improvement.

The following topic has been current in Europe for four years: Corporate Social Responsibility.

It is not necessary to analyse this notion (its decomposition has already been expressed) but one of the principal elements of a social behaviour of an organisation is to prepare employees for changes, to strengthen employ-

ment and to take care of employability. There is no need to suspect authors of a voluntary European initiative of putting pressure on organisations to behave „charitably”, but of putting pressure for social responsibility which should become matter of all (not law-makers).

### **AIM 2: EMPLOYABILITY**

A possible need to reduce the number of employees does not mean that an organisation breaks the principle of the accepted voluntary social initiative. However, the organisation can prepare people in view of their knowledge and skills and as a result their assertion (in case of terminating employment for any reason – such as transformation, redundancy, and bankruptcy) is on a high level. A „slimming” organisation does not become a „generator” of the unemployed.

The second rightful aim gets into the aims of training: to develop peoples' knowledge and skills and thus strengthen their employability.

One of the EU Board challenges is to ensure that the present systems (mainly those concerning quality management) deal with the questions of Corporate Social Responsibility and to ensure that applying social behaviour is a competitive advantage. The reaction to this is found in the following models: Investors in people, Excellence through people as well as EFQM.

### **FACTORS INFLUENCING EFFECTIVENESS OF TRAINING**

Simplicity and accuracy is best expressed through a number. The number has an informative character if it is given in a relation (to the set basis, benchmarking and the like) or considered within trends. When finding out effectiveness of training it is necessary to mention that the result may be influenced by:

- the analysis of training needs
- defining partial aims

- choosing the programme and compiling the plan
- the form

To eliminate undesirable influences or inaccuracy, which may decrease effectiveness of training, it is also necessary to monitor the training process itself and to look for components to be improved in it.

Apart from the training process, the effectiveness of training may also be influenced by other factors which may change, blur or totally „change the sign” of the result measurement. It is necessary to take into consideration even these influences for evaluation to make sure that a negative or unjustified positive result is not the reason for taking premature steps or measures. The influences may be the following:

- organisational changes
- employees' satisfaction
- wages adjustment
- information and communication barriers etc.

Correct evaluation of the influences of an organisation and subsequent interpretation of the results of the evaluation of the training effectiveness can notably help the organisation with supporting employees in their development.

### **AIM 3: CHANGES AND IMPROVEMENT**

#### **INVOLVED PARTICIPANTS IN EVALUATION**

We are going to state briefly what kind of information a particular participant can provide in relation to the evaluation of the training effectiveness.

Participant is an active user of acquired knowledge and skills and he provides information immediately after an accomplished training course. His evaluation may be influenced by his impressions and feelings. It is

possible to minimise the subjectivity of his evaluation by a well prepared and purposeful questioning or with an interview to a given topic, possibly with a later verification.

Trainer/lecturer is an active agent who participates in accomplishing the set objective of the training course by implementing a chosen form (methodology of training procedures) as well as with his approach to the participants and the topic. He himself may be the source of information about the employees' potential or a reflecting person of the topic that he can criticize.

Superior is an immediate user of the result of training in practice. He can assess how much the employees' potential has changed, how much the indicators of their performance have improved, and how many changes and improvements have been prepared or even implemented.

HR Department (personnel department) is important in the phase of preparing, implementing and participating in order to evaluate the training process. They are a coach and an adviser for a participant while making an analysis of an appropriate direction of development. They are a methodologist for superiors and an adviser while setting priorities and possibility estimates, and an implementor of the process. They can arrange or implement examining by means of an interview immediately after accomplishing a training course or after some time, they can sum up documents for an evaluation, evaluate themselves the efficiency and effectiveness of the training process.

Company management expects an organisation based on knowledge which is reflected in results. In order to accomplish its social responsibility it will be interested in the fact whether employees are ready for changes. In order to manage employees' knowledge the company management plans and approves sources and it therefore interested in the efficiency of the whole process.

Supplier/co-operator's assessment can provide interesting information about the organ-

isation's approach to them, about employees' approaches and opinions.

Customer's assessment should then reflect the relationship to our organisation, perspective of co-operation, satisfaction with the approach, and our employees' competence.

## METHODS OF EVALUATION OF TRAINING EFFECTIVENESS

This chapter includes various methods which can provide information for evaluation of training effectiveness.

*==> Evaluation of effectiveness from participant's point of view*

A participant of a training course provides important information to effectiveness of training from his point of view, on the basis of his personal approaches, ambitions, possibilities, experience, and preparedness:

- a) immediately after the course
  - questionnaire
  - controlled discussion
- b) after some time, for example after 3 or 6 months
  - controlled discussion

*==> Evaluation of effectiveness from superior's point of view*

The superior of a participant of a course is a person who should mainly be interested in applying knowledge and skills of his inferior in reality. His evaluation should be done after some time after accomplishing the course. In order to do a better evaluation he should know what kind of training the evaluated person accomplished and to what extent.

It is possible to use two types of questionnaires to do an evaluation:

- a) analogical questionnaire completed by

the participant (to make it easier for the compiler to compare)

- b) complex questionnaire which also includes the participant's personal development

*==> Trainer/lecturer evaluation*

This evaluation is important for employees in the HR department (personnel manager) as it can bring reactions and impulses from participants to further development, barriers in an organisation and the like.

In this respect it is not desirable to react with a questionnaire. Participants provide their opinion of the specified field, e.g. whether the place of the organised training course was appropriate, how much they were captured by the topic, what activity they demonstrated, their ideas of improving and further participants' development, and what they found most difficult to cope with.

*==> HR (personnel manager) evaluation*

The HR department is important and unsubstitutable in analysing the state and needs of training in an organisation, and mainly in preparing and implementing the training process. The HR department makes forms and documents for evaluation of training effectiveness. The evaluation should also concentrate on evaluating the following: precise analysis of the state of employees' competences, programme completeness, plans of training courses, appropriateness of training forms, trainers/lecturers' level etc.

The result may be a report, statistical surveys and adapted methodologies. The standpoints to the following signs may be a guideline to work out the impact of training:

- changes in participants' opinions;
- where the training has changed the situation;
- where the training has had no impact/effect;

- whether people realise the whole extent of changes caused by the training;
- whether it is expected that more changes will happen in the long run and in which areas.

## STAFF CERTIFICATION

We have to bear in mind that the real evaluation of efficiency of a company education is a longtime matter and it is reflected in the company culture. Permanent cultivation of job environment, ability of communication, enough information, general order, creative employees' attitudes and many other important factors usually suggest promptly what the values in a company are, what its employees are like, how efficient the care of education is and how it is reflected in the company culture.

All of these facts were taken into account by the creators of the amendments of the ISO 9000:2000 standards and, unlike the original version, the revised standards use to the maximum the requirements for professional competence of employees and their further development.

In reality it means that the company management has to ensure regular evaluation of all employees' competences, then to compare the existing level of competence with the present as well as future requirements and on the basis of the found facts to set up a plan of education of all employees. Consequently, it has to ensure a necessary training course and to evaluate its effectiveness with regard to assets for a company where effectiveness is to be understood as a degree of fulfilling objectives which should be achieved through training.

The so-called „staff certification” is becoming a permanent part of activities for evaluating knowledge, professional erudition and employees' skills. This means that employees' abilities and competences are checked independently concerning whether the employees can perform particular functions (both professional and managerial). Staff certification is experiencing a sweeping development in

the world and we can rightly assume nowadays that it is becoming an extraordinarily important and prospective part of management which starts to be even respected by many Czech companies, organisations as well as organisations of health care.

A certified staff in organisations is gradually becoming an important prerequisite for successful building and further development of not only the company management system but also of the company management in a general sense.

The level of the staff can only be assessed by impartial and independent companies, the so-called accredited certification bodies. They are entitled to issue certification on conformity (personal certificates). (Accreditation is an official acknowledgement that the certification body is qualified to perform assigned activities and it meets the requirements of independence, integrity, qualification, and impartiality).

## IMPORTANCE OF STAFF CERTIFICATION:

1. It is a logical culmination of education and employees' training.
2. It is the best form of how to prove a real ability to hold a function.
3. In the context of the EU policy it is an important form with regard to recruiting new employees.
4. It is a tool of managers and technicians' motivation aimed at processes of permanent self-improvement.
5. It is an important prerequisite of personal development and personal management.
6. It makes organisations more secure that they employ competent specialists-professionals.
7. In case the fees for the certification are settled by the organisation, it appreciates thus existing assets of an employee for the company.
8. The personal certificate is a highly respected document while performing external audits.



Possessing a personal certificate, the holder can thus have an important competitive advantage on the labour market. Also, it is worth mentioning that it fully fits into the requirements of the set of the ISO 9000:2000

standards for processes of people management where it is necessary to prove employees' competence and to measure efficiency of their education and training.

# **Teaching Business Disciplines at the Budapest University of Technology and Economics**

## **- Opinion of Stakeholders**

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As of the middle of the last century – starting from Western Europe and North America – higher education increasingly develops into mass education. The old-time elite education – with the main objective to supply scientific and arts elite – is changing, first of all, in order to meet needs of the labour market [1]. These changes essentially affect not only the forms of education but also its contents [2]. Most known and most important phenomenon of these requirement changes is the Bologna process. Within it the two-level education becomes general – at least in Europe, based on the Anglo-Saxon sample –, i.e. the first phase of the traditional university training is increasingly oriented towards the labour market, and in the second phase a much wider choice of trainings is offered to students than before. Actually, the reason of the Bologna process, explained in general as standardization of trainings, is the continuous incursion of mass higher education and increasing importance of the requirements of

the labour market as the most essential demand. You can hardly disagree the statement that the labour market offers – even in the highly developed countries – few jobs requiring university graduates with strong natural or social scientific background, able to think abstractly and skilled in solving labour problems in a scientific approach. On the contrary, jobs calling for graduates with a practical way of thinking and with not so much and not so deep practical knowledge are offered. The higher education defined by the Bologna process trains graduates as defined above, supporting, first of all, meeting labour market requirements. This process is just strengthened by the credit system aiming at standardization of particular formal features of trainings, thus helping to find harmony between students' sphere of interests and training services offered.

The content of training was influenced by the mass higher education even in other

aspects. The student and labour market oriented training gradually replacing the traditional university education focusing on scientists and sciences supplies different subject material. Countries switching now to two-level education have – almost without exception – a developed and service-oriented economy, where employers appreciate any expertise in planning and organizing services [3]. Accordingly, in „product-oriented“ (like engineering and agrarian) trainings more and more units (subjects, modules) appear that supply information about features of services related to the given product (machine, compound, building, etc.) [4]. Changes in content are even more justified by appearance of market economy approaches and, in parallel, by strengthening of the place and role of business sciences – especially in the former state socialist countries. In „traditional“ curricula focusing on scientific and research aspects of a given profession, disciplines have come into the foreground that are related to application and usage, thus, to knowledge and capabilities needed in the labour market. Among others business studies belong here; and being proficient in this field is today much more a must than an advantage, except the case if you want to build a career as professor of a narrow scientific area [5]. Business and economic studies are inevitable for becoming a manager or executive who is able to get on in his/her profession as a whole – in the authors' opinion – just like English language for scientific research as an example. Most Hungarian higher educational institutions launch new multidisciplinary courses (such as engineering management, agricultural economics, etc.) offering a specific mixture of engineering and economic subjects. These courses are popular among students and their graduates are welcome in the labour market. Apparently, this general trend cannot be stopped. For example in Hungary, economists and businessmen and business women are trained almost in 30 institutions – at college or university level. Even more, curriculum of almost every faculty contains a management module – irrespective of the fact whether mathematicians, teachers, doctors, engineers or agricultural specialists are trained at the given faculty.

This is likely to be the main reason of the increasing popularity of the economic-business subjects, subject packages also at the engineering faculties, growing weight of economic disciplines – integrated into or supplementing the courses preparing students for construction and development jobs.

In our paper we study the courses offered by the Budapest University of Technology and Economics (BME) what effects they have on the students, on players of the labour market. In our studies we rely on the database of BME: since 1998 the University measures and evaluates the opinion of fresh graduates and enrolled students. Since 2001, the research comprises also employers.<sup>1</sup> These surveys aim at getting insights into satisfaction of the labour market and at allowing feedback of results into the university strategy. Survey of management studies offered in the engineering training was partially extended to the students enrolled to post-graduate MBA training of the University – originally graduated from the University of Technology as engineers – for comparison of some properties of the fresh graduates and MBA students –, first of all, in order to demonstrate their incomes.

## 1. INTRODUCTION

Before publishing details of the surveys, we briefly describe the higher education in Hungary. In harmony with the trends in Central Europe, students' number in the Hungarian higher education has quadrupled over 15 years after the switch to market economy (1990). This table shows the trends.

Dynamic growth of students' number occurred within a strong demand encouraging policy of the state [6], that is why only 18% of students in the full-time graduate education, being the main line of education, paid a tuition fee (cost reimbursement) in the academic year 2003/2004 although the possibility of launching trainings against tuition fee<sup>2</sup> (cost reimbursement) has been open for universities and colleges since 1996. It is important to underline this feature because this

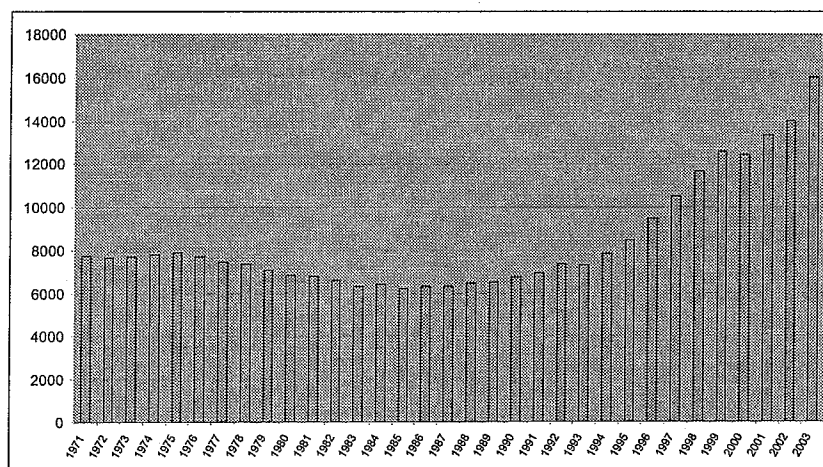
Year	1990	2002	2003	2004
Total number of students	108 376	349 301	381 560	409 075
Students' no. in economic higher education	9 471	66 943	78 301	87 057

*Table 1: Number of students in the Hungarian higher education  
(Sources: Statistics of Ministry of Education)*

demand growth generated by the state was „tendentious", it was partially aimed at reserving the status quo developed. As a result of it, growth of students' number was not wholly in harmony with the requirements of the labour market – or more precisely, with students' interests based on labour market information –, i.e. selection of students (parents) was limited by the bureaucratic co-ordination of the state-financed university capacities [7]. Number of full-time students at the surveyed Budapest University of Technology and Economics in basic trainings changed between 1971 and 2004 as follows.

## 2. DEVELOPMENT OF TRAINING OFFERINGS IN THE FIELD OF ECONOMIC AND SOCIAL SCIENCES

Subjects of economic and social sciences offered in the past 15 years at BME within the curricula of the engineering courses – as mandatory, obligatorily selectable or optional subjects – show a rather eclectic picture. For „luck” of the survey, standardization and systematization began in the middle of the 90s, the University defined their ratio in the curricula in 1998. Considering the fact that most surveys are related to the period after 1998, we regarded the subjects offering – with due



*Chart 1: Change of students' number at BME  
Sources: BME Directorate for Training*

approximation – as constant. Furthermore, we neglected that the individual engineering faculties offered their students economic and social scientific subjects in different ways, – partially taught within their own capacity and partially bought from the Faculty competent in the given field. We also neglected the fact that engineering faculties defined the volume of the subject „packages” to be taken in the field of economic and social sciences in different chronological distribution and sometimes – projected to the whole training (300 credits) – with 5-10-credit differences. Neglecting this latter does not generate any problem – in our opinion – because faculties allowing to take up less management subjects, typically, did not supply less business knowledge – as shown in training statistics of the University –, this knowledge was rather integrated in technological subjects offered by the own specialized departments of the faculties – first of all, due to traditions [8].

### 3. EXPECTATIONS AND IDEAS OF STUDENTS NEWLY ADMITTED TO THE BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS

Expectations and ideas of newly admitted students have been collected by the help of questionnaires at BME since 1998. Return rate of questionnaires was in the years examined on average 36% (32.2% (2000), 36.9%

(2001), 40.8% (2002), 34.5% (2003)). Due to methodological considerations, we analysed the data of students beginning their studies in 2000 up to 2003 because the questions asked in this questionnaires were (already) uniform in these years.

The students evaluated their study expectations on a five-grade scale where 1 meant the least important and 5 stood for most important. *Table 2* shows the system of expectations developed this way.

It can be stated that the first-year students have high-level expectations towards the university education. Grading results in three groups (above 4.3: very important, 4.0-4.3: important, below 3.9: not much important), almost no criterion can be found in the worst qualification group. Dominance of the high-value diploma (good employment chances), modern subject matters (both printed and electronic) and highly-qualified lecturer staff in the system of expectations of newly admitted students has become obvious over the years. Aspects of atmosphere of training, human relationships and system of requirements (eliminating intransparency of the credit system) are in the middle group, with almost unchanging results in the four years of the survey (4.0-4.3). Demands for financial, economic and organization knowledge have been placed in the last group for years, but the demands for high-level theoretical knowledge can also be found in this group – after a drop.

	2000	2001	2002	2003
Financial, economic, organization studies	3,5	3,2	3,4	3,3
High-level theoretical background	3,8	4,0	4,0	2,6
Clean-cut system of requirements	4,0	3,9	4,2	4,2
Practice-oriented training	4,1	4,2	4,1	4,0
Good lecturer-student relationship	4,2	4,0	4,2	4,1
Good student community	4,2	4,2	4,3	4,2
Highly-qualified, excellent lecturers	4,3	4,5	4,5	4,5
Modern subject materials	4,3	4,4	4,4	4,5
Good employment chances	4,4	4,6	4,6	4,5

*Table 2: Expectations of newly admitted students from the University (on a 5-grade scale)*

Expectations towards business management and economic knowledge show a falling trend except for 2002. This may be explained by the following facts:

- In 1998 the engineering management training, in 2001 training of economists were launched at BME. Students with a strong interest in economic and social sciences must have applied for these courses; people wanting to acquire knowledge necessary for „traditional” engineering jobs (construction and development) enrol in high numbers to the engineering courses;

- From data of Table 1 reveals that economic and business higher education expanded more dynamically than average. We may say that ratio of students that applied earlier – by necessity – not for business higher education has fallen, accordingly this effect was felt also in the engineering training;

- Due to measures for stabilizing the economy in the middle of the 90s, the industrial sector began to expand again; after its collapse in the early 90s it was revitalized and needed engineering specialists in high numbers. This may be again a reason for decreasing demand for non-traditional engineering subjects (like business studies) in graduate education;

- In the past 15 years postgraduate trainings have become extraordinarily popular. Number of students attending this type of trainings has septupled at the University of Technology alone. Therefore a great deal of students of graduate engineering courses is likely to acquire this kind of knowledge – if they want to – having got their first diploma.

Newly admitted students have a more definite opinion concerning their employment after getting the diploma: the trend revealed

in this field – dominance of construction and development jobs – is likely to be the result of the processes mentioned above. Decisive part of students recently admitted (65-70%) voted for construction and development – engineering – jobs, although their ratio has diminished in favour of jobs in category „miscellaneous” (HR, information technology, management, etc.). This contrast is prominent, and can mainly be attributed to the fact that young people just leaving high-schools can see themselves at the beginning of their university studies in the most spectacular and most exciting jobs – being closest to their visions connected to a technological university

In addition to the dominance of the construction and development jobs, categories manufacturing and building as well as miscellaneous appear, while role of commercial, financial and marketing jobs is minimal. Even more, these opportunities were represented among ideas of fresh admitted student with a diminishing trend – as it can be seen in the Table below (*Table 3*).

The highest values were obtained in 2001 with eye-catching results for trade and marketing (in relation to the other years analyzed within the categories), while the position of jobs in finance and economics is more balanced. However, as of 2002 a definite drop can be observed – about 2-3% of respondents had this kind of intents.

#### 4. OPINION AND EMPLOYMENT OPPORTUNITIES OF STUDENTS GRADUATED FROM BME

Follow-up survey of BME is done again by questionnaires. Survey methodology and def-

	1999	2000	2001	2002	2003	2004
Trade	5	3	7	3	3	3
Finance	2	3	5	3	5	3
Marketing	5	7	5	3	4	2
Economics	2	2	4	2	3	2

*Table 3: Share of business jobs in the opinion of respondents (%)*

inateness of questions allowed analyzing a longer period: we could include data of graduates' survey of all years between 1997 and 2002. The survey was performed on the complete sample in each year, return rates of questionnaires were in order of years 36%, 26%, 26%, 30%, 25%, 37%. Within this follow-up survey, opinion of graduates about strengths and weaknesses of the university training was asked. The choice of strengths included practical knowledge, preparation for professional problems, financial, legal and communications knowledge, discussion of human relationships and category „miscellaneous”.

Conveying financial, legal and communications knowledge belongs to strengths of the University in the opinion of 10% of the students on average. Students that graduated from the University in 1998 had the most favourable opinion until now (12%), while the negative peak belongs to graduates of 2000 (5%). We find important to mention that answers characteristically vary with faculties. In the case of the Faculties of Mechanical Engineering and Transportation Engineering this kind of knowledge is indicated among strengths with an essentially greater emphasis (although this ratio significantly diminished in 2002 – however, at the other faculties it shifted just in the opposite direction), while

the ratio of favourable opinions is low at the Faculties of Chemical and Electrical Engineering and at the Faculties of Architecture and Civil Engineering (below 10% in each year of the survey). As probable reason of this variation between faculties we can mention that teaching of management subjects has a longer tradition and a larger weight at the Faculties of Mechanical and Transportation Engineering. Opinion of about teaching financial, legal and communications subjects is plotted in the following chart. (Chart 2)

Opinion about weaknesses shows a less balanced picture in the individual years of the survey, although the criterion professional practice, that got the highest rate, stands out distinctly. Judgement of subjects beyond professional materials (besides information technology, e.g. economic and management knowledge necessary for working as engineers) as a weakness has improved essentially with time; the maximum value given by graduates in 1998 (25%) has dropped continuously and stopped at 10% in the case of graduates in 2002. As the most important reason of this phenomenon we state that – besides the traditionally strong postgraduate manager trainings of BME, first of all, because of graduate business courses launched or intended to launch – teaching of management subjects also in graduate courses has

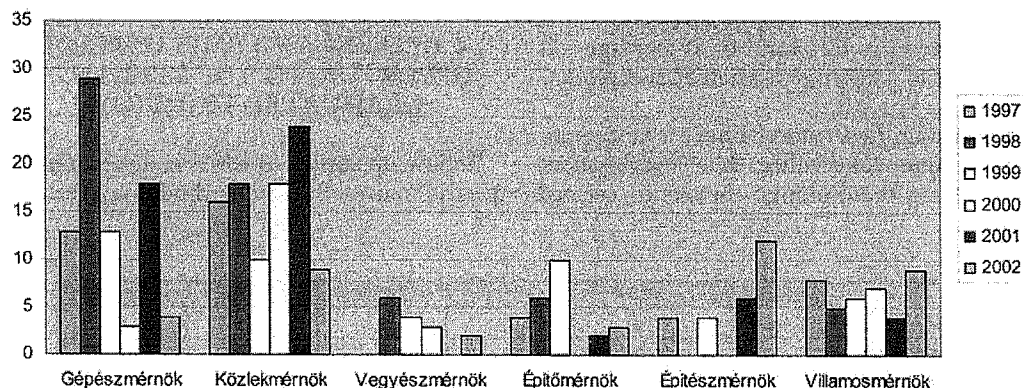


Chart 2: Indication of financial, legal, communications studies as strength at the individual faculties (%)

Subjects beyond professional issues	Mech.eng	Transp.eng	Chem.eng	Civil.eng	Architekt.	Electr.eng
1997	17	12	31	21	19	28
1998	21	17	11	30	18	15
1999	18	24	22	16	22	16
2000	3	6	9	9	17	4
2001	13	12	10	19	10	16
2002	3	3	8	7	13	5

*Table 4: Judgement on weaknesses of the university training, broken down by years and faculties (%)*

continuously developed, improved both in terms of offerings and quality. Analyzing the results of the faculties separately, we can find the definite counterpart of strengths: it was negatively evaluated with a low percentage (20% or below) at the Faculties of Mechanical and Transportation Engineering, while at the other faculties it was much more missed or indicated as a weakness, especially by graduates in 1997-2000. Our next table illustrates its break-down by years and faculties (*Table 4*).

Demand of graduates for further education has an absolutely positive trend in the survey: ratio of graduates who want to attend further education courses never was lower than 95%. Demands for professional and economic trainings are represented almost the same, however, in the last sample demands for economic-type trainings definitely dominate over professional courses (economic: 58%, professional: 42%). In this respect, it is rather important that quite the half of the further education trainings is dominated by economic ones. As a reason of this phenomenon the assumption is obvious: sphere of interests and presumed career opportunities significantly differ from those of students just enrolled for the first year. This high demand of graduates for further education is interesting, and gives rise to diverse conclusions – we will see later that not under unbeneficial income conditions at all. On the other hand, we can state that after five years of engineering studies and with some work experience, about half of the graduates prepare for changing, or at least, correcting their careers, strongly appreciating economic-business

background, that had been considered not so important when admitted to the University. We can say that this phenomenon is general for the basic trainings in higher education. Objective of the third survey in April and May 2004 in connection with the FIDÉV research, to be mentioned later, was to review the labour market situation of two cohorts (graduates of 1998 and 1999) in February 2004 and to understand the most important changes (education/training, labour market movements, income) between the first and second date of survey. This means that for the first cohort conditions recorded in September 1999 and February 2004, and for the second cohort the conditions recorded in September 2000 and February 2004 were compared. Furthermore, changes in labour market status and in training/education occurred between both survey dates were also reviewed. The most essential statement of the third survey about further education of diploma holders was that young graduates attended different training forms in extremely high numbers in the first years of their careers, and economics was outstandingly strong represented in further education [9].

Chronological distribution of the types of further education is demonstrated in the chart below (*Chart 3*).

Also employment opportunities and characteristics of jobs held after graduation can be studied on the basis of the answers. Ideas of the students discussed before – fresh admitted students – show a strong correlation with the employment characteristics of the graduates at least in their proportions, but not



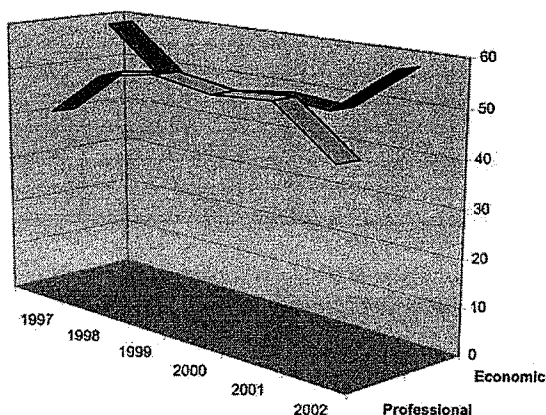


Chart 3: Further education demands of graduates (%)

quantitatively. Engineers graduated from BME work in most cases in constructional and development jobs (in a balanced percentage of 50% over the years), besides, jobs belonging to the miscellaneous category are determinant (25-30%). Manufacturing and operational jobs were popular in the latest years (especially in 2002), but also trade and, in the earlier years, quality assurance offered almost the same employment opportunities (with typical values about 10%). The trends can be well traced below (Table 5).

## 5. RESULTS OF EMPLOYER SURVEYS

Survey of employers was done by questionnaires, while the interviews were made by per-

sonal phone inquiries. There were surveys in three years (2001, 2002 and 2004) until now in five regions – that can be regarded as typical – of the country (comprising 11 counties) including business organizations and budgetary institutions working there. The sample was designed on the basis of the – labour market – surveys and existing database of the Hungarian Labour Research and Methodology Centre, being not only representative but also ensuring a high survey rate: about 40-45% of companies were interviewed in each year.

Employers judge that engineers-entrants have an average-level background in organization and economics or above: on average 80% of respondents (in the individual years: 78% (2001), 84% (2002), 82% (2004)) found capabilities good in the first category; in the latter cat-

	1997	1998	1999	2000	2001	2002
Construction, development	47	54	50	50	50	45
Manufacturing, operation	13	11	8	12	11	23
Quality assurance	9	6	6	3	9	0
Trade	5	5	7	4	5	7
Human resource management	1	1	1	0	0	0
Finance, economics	1	2	1	1	1	1
Marketing	5	4	2	2	1	0
Miscellaneous	20	19	27	29	24	26

Table 5: Employment of graduates from BME in the years of surveys (%)

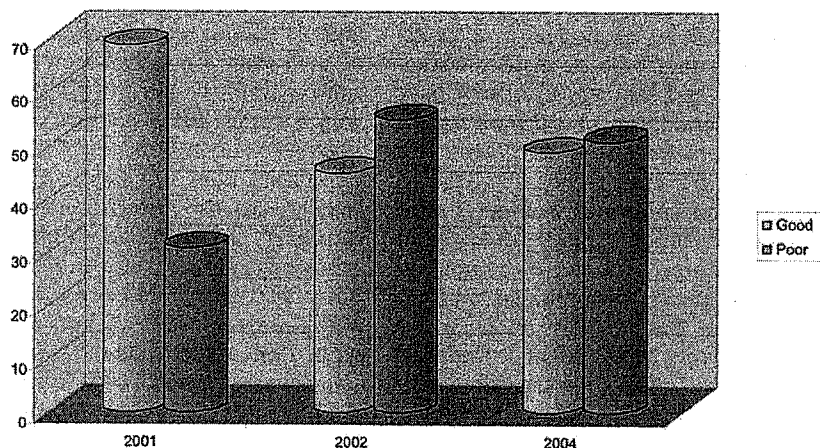


Chart 4: Judgement about economic knowledge of engineering entrants (%)

egory the typical opinion was again favourable – however, with a large drop in a year. It would be hard to draw any special conclusion from the above, considering that it was language proficiency and practical knowledge of graduated engineers that employers found poor in each year. Probably (and reasonably) fresh graduates were mainly employed in jobs where they fundamentally had not to prove their capabilities in business issues. Opinions

about economic knowledge are demonstrated in the following chart (Chart 4).

Companies support further educations mentioned above – and assumed as necessary – in different forms and to a varying extent.

Although the intent is obvious, opinions about type and form of further education do not show such a uniform picture. There is a greater variance concerning type of trainings: professional further educations still play a

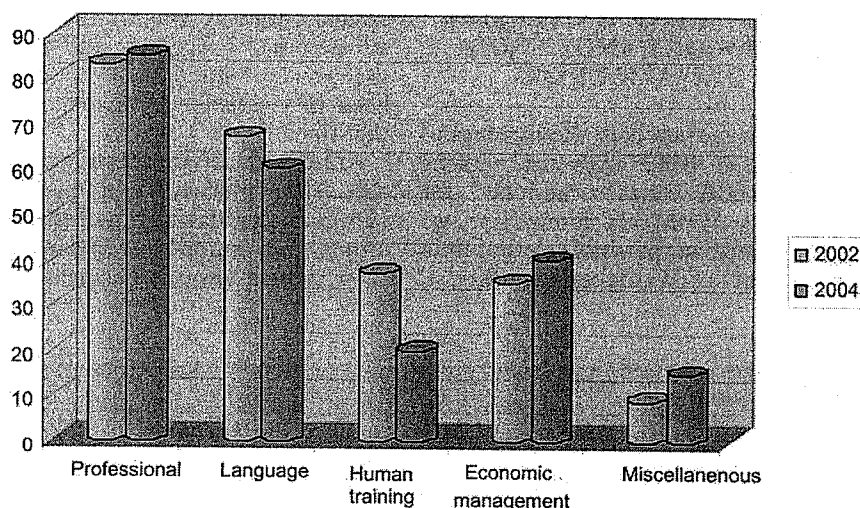


Chart 5: Ratio of individual fields of further education supported by employers in 2002 and 2004

dominant role (80% of employers find necessary and support this type of further education). Language and human trainings have shown a falling trend in the past three years. In 2002, 67% of employers supported language courses, and this fell back to 60% by 2004. In the case of human courses this drop is even more spectacular: support ratio has changed from the earlier almost 40% to 20% by now.

Ratio of economics and management in further education has slightly risen in the opinion of employers from the earlier value of 35% above 40% by 2004. This trend is little-bit in harmony with further education preferences of fresh graduates. Not surprisingly, employers prefer professional further educational courses to the economic ones: by the millennium, output of students in the fields of economics and business has essentially grown.<sup>3</sup> Another employer survey, too, links the surveys among fresh graduates with the employer surveys and confirms their results [10]. According to it, the largest vertical incongruence is among the engineering graduates – explaining the general desire for further education of graduates from the University of Technology (*Chart 5*).

## 6. DESCRIPTION OF INCOME SITUATION OF ENGINEERS GRADUATED FROM THE UNIVERSITY OF TECHNOLOGY AND ENROLLED TO MBA COURSES

In this chapter we compare the incomes of fresh graduates of BME with the persons applying for MBA courses launched for diploma holders. With this comparison we provide a picture about persons engaged for a career correction – towards management –,

and try to find relationships between features of both samples. It has been BME for a long time to train the most MBA students in Hungary – within MBA courses organized by the Faculty of Economic and Social Sciences. Its popularity does not fade; many persons are ready to pay the tuition fee unusually high in Hungary in order to study management knowledge standards at high level. BME has been surveying the students enrolling to MBA courses – with various methodologies – since 1998, return rate of electronic questionnaires varied around 40% in each case.

Characteristics of the samples included in the survey (*Table 6*).

Number of engineers graduated from the University of Technology is determinant among applicants for Master of Business Administration training each year. As an important characteristic, about 85-90% of students has an engineering diploma, most of them graduated from BME in the following distribution (*Chart 7*).

Comparing chart 7 with chart 2, we can draw the following conclusions:

- High ratio of graduates of the Faculty of Electrical Engineering and Information Technology among applicants for MBA training is not surprising. This faculty's annual output is roughly the total output of all the other 7 faculties; and chart 2 reveals that previous students of the faculty had not been very satisfied by management subjects that time.

- Low ratio of architects was also foreseeable. Although they had not been satisfied by subjects discussing management issues either, but number of persons correcting their careers towards business sciences rela-

Sample	2000	2001	2002	2003
Population	165 persons	210 persons	319 persons	570 persons
Number of respondents	72 persons	81 persons	104 persons	188 persons

Table 6: Characteristics of the sample for income survey of MBA students

	Architekt.	Civil.eng.	Mech.eng.	Transp.eng.	Chem.eng.	Electr.eng.	Total	Total number	Ratio
1998	2	6	13	1	3	35	60	134	45%
1999	2	8	9	4	8	22	53	193	27%
2000	2	12	19	6	8	52	99	363	27%
2001	5	9	13	9	6	49	91	369	25%
2002	1	4	15	8	10	42	80	284	28%
2003	1	8	10	4	4	45	72	296	24%

Table 7: Ratio of graduates of BME among MBA students broken down by faculties

tively early is low – presumably due to the determinant arts character of the training. Furthermore, the faculty offers management courses – specifically for graduated architects discussing various fields.

– Students of the Faculties of Transportation Engineering and Mechanical Engineering had rated business training much better than at the other faculties that time, therefore their relative low ratio among applicants to MBA is explainable. When comparing data, the fact should be taken into account that behind the Faculty of Electrical Engineering and Information Technology, most students graduate from the Faculty of Mechanical Engineering, roughly twice the student output of the Transportation Engineering.

It is worth studying issues from several aspects both among fresh graduates of BME and among former BME students applying for MBA courses. In a general approach we can compare the average incomes, however, a distinction should be made between incomes of MBA applicants in executive and non-executive positions, as values essentially differ. About 62.3% of persons enrolling to MBA trainings work in executive positions while this ratio is only 21.7% among fresh graduates. The next chart displays the incomes of intellectual in the analyzed period (Chart 6).

Number of employees is also determinant for incomes: there is again a distinct difference between both samples, however, it does not affect the characteristics originating from

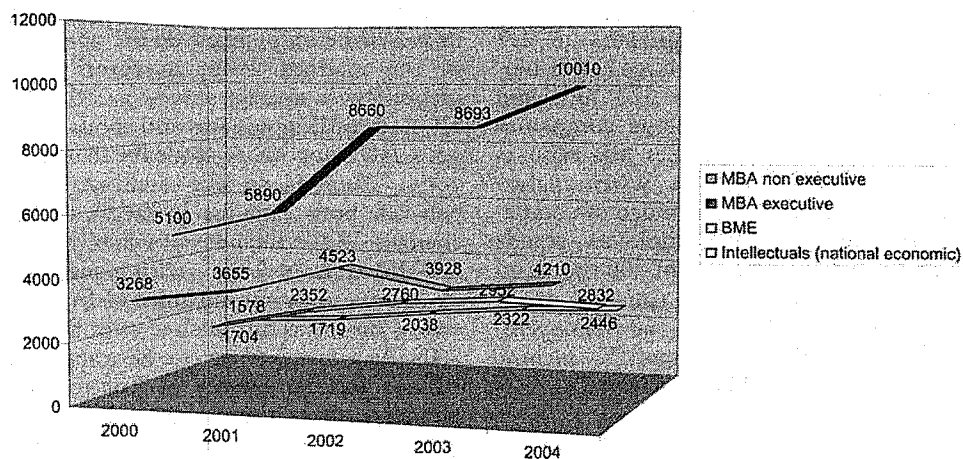


Chart 6: Average gross incomes in the analyzed years (thousand HUF)  
Sources: MBA and BME surveys, KSH Hungarian Statistical Office)

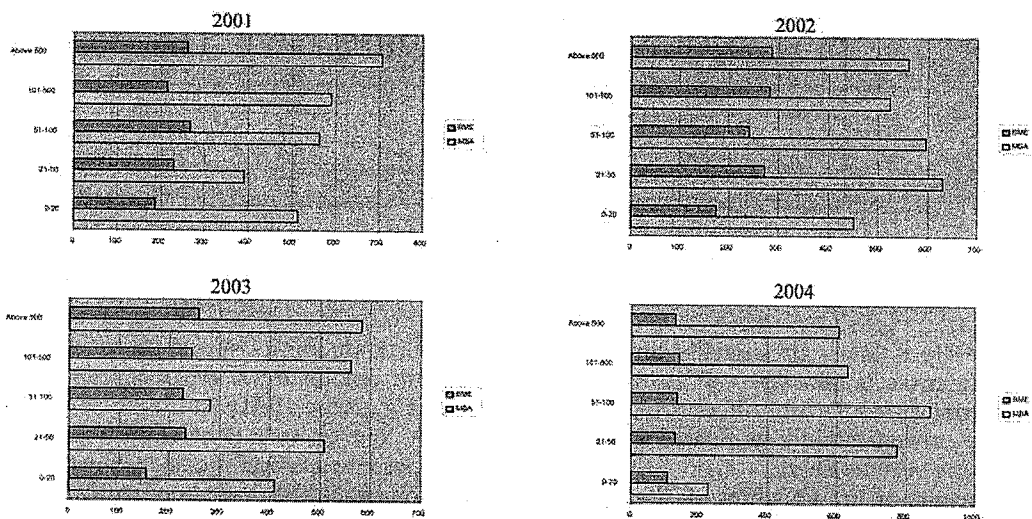


Chart 7: Incomes in the individual samples in the analyzed four years – in function of company size

the number of employees of the companies. The chart clearly reveals that incomes in companies with a few employees (below 20 persons) are the lowest, in companies with medium or high number of employees there is a balanced „contest”. For BME graduates average incomes in the individual years in the case of companies with 21-50 employees amount to 216 thousand HUF a month, for companies with 51-100 employees to 217 thousand HUF a month, for large companies with 101-500 employees to 220 thousand HUF a month, while for large companies with more than 500 employees this value is 233 thousand HUF a month. When analyzing MBA students, the advantage of companies with more than 500 employees stands out (with a monthly income of 706 thousand HUF) in 2001, but with the time the medium-size companies (with 51-100 employees) attained this position with a monthly income of almost 900 thousand HUF (Chart 7).

Also the ownership structure of the company has a great influence on the incomes: this applies both for MBA and BME students. Apparently, incomes are the highest in foreign-owned companies; this trend is more

distinct for MBA students (about 2.5-3 times the incomes of fresh graduates from BME). You can see that incomes in Hungarian companies are lower; presumably, this is due to the lower standard pay. Incomes of graduated engineers are between 120 and 200 thousand HUF, while MBA students work again in better-paid jobs (with incomes between 420 and 580 thousand HUF). Companies with mixed ownership structure are again placed in the medium zone in terms of gross incomes with average values of 220 thousand HUF for BME graduates and about 515 thousand HUF for MBA students in the past 4 years. There is an eye-catching difference between both samples in trend of income changes. While incomes of persons enrolling to MBA courses show – with a slight drop – an increasing trend, incomes of fresh graduates of BME has diminished after the peak in 2003. As a curiosity we cite here some data of FIDÉV (Career Survey of Young Diploma Holders), three times repeated in Hungary among fresh graduates until now. FIDÉV studies referred to here ([11], [12]) comprised full-time students graduated from basic trainings in 1998 and 1999; this questionnaire-based survey can be compared with data of

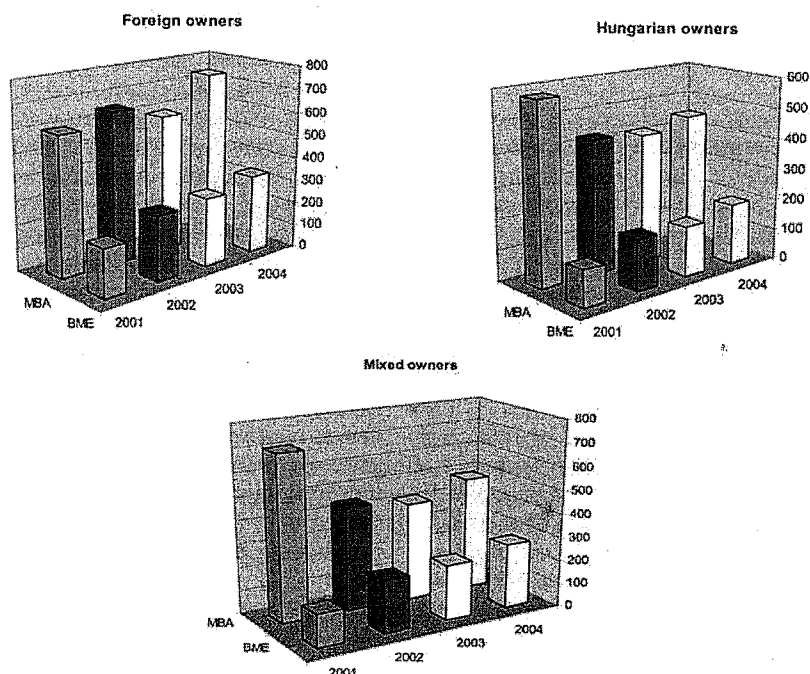
the fresh graduates of BME. According to the second data recording in 1999, monthly net income of university graduates in the field of economics, first ranked in this survey, was 117 thousand HUF, while that of fresh university graduates in the field of engineering was 86 thousand HUF.

In 1999, the labour market appreciated – according to this survey – the university graduates in economics the best. Knowing these data, the result of the BME survey, i.e. many engineering graduates want to obtain business and business background, is much less surprising. In 1999, average monthly gross income of fresh graduates from the University of Technology amounted to 196 thousand HUF according to the BME survey. It can be seen that the University of Technology has nothing to shame for, in terms of net incomes, its graduates did not earn less than economists with a university degree (*Chart 8*).

Having compared the incomes we can come to the following conclusions – fundamentally from the aspect of acquiring management knowledge:

– Distinctly higher incomes of persons in executive jobs, strong dynamics of their growth confirm the statements of other researchers. The trend after the system change can also here be observed: incomes of persons in executive jobs are much higher than those in non-executive jobs, income growth rate is larger, their relative income advantage continues to grow [13].

– Considering average incomes we can state that for MBA trainings of BME enrol employees the incomes of which are essentially higher than the average income of intellectuals. This can be explained either by the high tuition fee or the fact that an MBA training is deemed to be a good investment above a particular income level or attained position.



*Chart 8: Incomes within the individual samples in the analyzed four years in function of ownership structure*

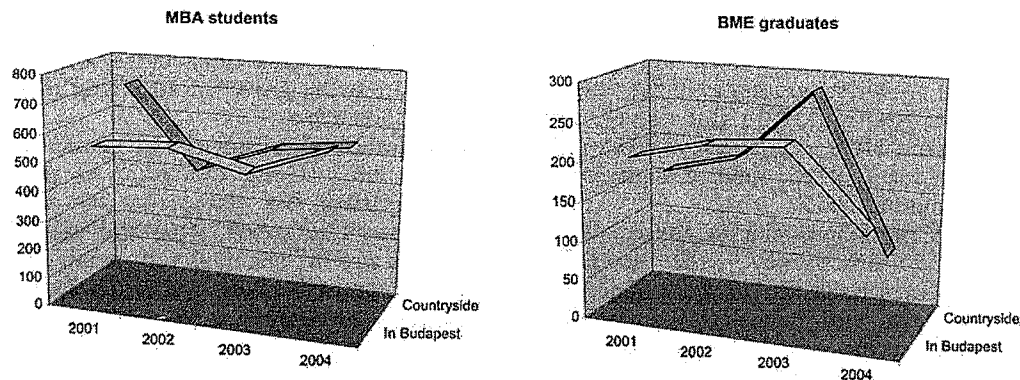


Chart 9: Incomes within the individual samples in the analyzed four years in function of geographical location

– We can also state that – except for 2001 – after various segmentation of jobs (by owner, size and location of the company) income situation of fresh graduates and persons enrolling to MBA trainings is similar (Chart 9).

## 7. SUMMARY

From results of the surveys we have drawn the following summarizing conclusions:

1. Both students enrolled for their first diploma and fresh graduates evaluate management knowledge in engineering training higher and higher. While most students in the first year see themselves in constructional and development jobs, about half of the graduated engineers ponders a career correction and wants to enrol for a further education in business and economics.

2. The above statement might be related to the fact that fresh graduates do not regard the business background that can be acquired in the graduate training as strength of the training, and this type of capabilities and skills do not belong to the most important requirements of employers towards entrants either. However, further education in the field of economics and business is appreciated also by employers – but explicably somewhat less than by the fresh graduated employees.

3. In most cases, engineers with outstanding

incomes enrol for the most popular postgraduate business training of Hungary (MBA courses organized by BME GTK), a determinant part of them as executives, i.e. having decided for a career correction. We conclude from this phenomenon that high-level business studies are important for persons with a different basic education: they find necessary to get a relevant higher-education degree not only for attaining higher incomes and holding executive jobs ensuring almost automatically these incomes, but also for retaining these jobs.

4. There is another interesting relationship: although engineering students do not evaluate business knowledge acquired in the graduate engineering training high, yet the most popular postgraduate manager training is offered at BME, many engineers opt for it. It is likely to have a double reason being similar both on the part of the lecturers and students: Neither students nor lecturers participate in the state-financed trainings so intensely than in the separate and highly paid (charged) courses with a tuition fee (cost reimbursement).

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- 2 Hungarian laws on higher education define tuition fee a kind of fine, typically in a small value, levied for non-fulfillment, delayed or not complete fulfillment of study obligations. Fees proportional to training costs – sometimes covering them –, i.e. the „classic” tuition fee is called cost reimbursement.
  - 3 According to the statistical yearbooks of the Ministry of Education issued every year, number of students graduating from colleges and universities at present is twice the number in the year of the system change (Kertesi-Közlő [2005])

# History of the WFEO Committee on Education and Training

*Prof. Miguel Angel Yadarola,  
Past President of the WFEO CET, Argentina*

## **I. WFEO IS CREATED PROMOTED BY UNESCO**

On November 16, 1945, UNESCO was created as an Agency of the United Nations responsible for promoting and strengthening education, science and culture.

In the fulfillment of these objectives, the Organization established strong links with the scientific sector that was represented internationally by ICSU leaving organized engineering without a unified presence and its own identity to act globally, specially with the United Nations.

Conscious of the need to establish closer links with the existing engineering organizations in several regions of the world, the officers of UNESCO, specially its Director General, established the basis to summon the main organizations: UPADI (America), FEANI (Europe), CEC (Commonwealth) to participate in the International Conference of Engineering Organizations (ICEO) in Paris between 4 and 7 March, 1968. The purpose of the Conference was „to contribute to the progress of the engineering profession aimed at general interest and to create a spokesman for the preoccupations and aspirations of the engineering organizations”.

The representatives of UPADI, FEANI and CEC who met at the Headquarters of

UNESCO in Paris to which later was added FAE (Federation of Arab Engineers) resolved to create the World Federation of Engineering Organizations. Dr. E. Choisy from France was elected President and as Secretary General Dr. G. F. Gainsborough (United Kingdom). An Executive Committee was elected formed by eleven national and international members.

During the founding Assembly of WFEO in Paris, it was decided to create the first Permanent Committee: „Engineering Information”. At the second General Assembly also held at the UNESCO Headquarters the creation of a new Standing Committee on Engineering Education was decided on 28-30 October, 1969 with the purpose of opening a new field of activity in a priority area open to the participation of the Members of WFEO. UNESCO had offered its support and the Canadian Council of Professional Engineers CCPE the Headquarters and Secretariat.

## **II. THE INITIAL PERIOD. THE COMMITTEE ON E&T IN CANADIAN HEADQUARTERS**

### **FIRST MEETING – MONTECARLO 1970**

The first meeting of the Committee on Education and Training (CET) was held in

Montecarlo, on 1-3 December, 1970, with the sponsorship of UNESCO, that provided the funds for traveling and lodging expenses of the participants. Besides, this Organization was present at the meetings of the Engineering Education Section – Division of Technological Research and Higher Education Dr. Alexander Evstafief. The Members of the Committee, by the end of 1970, participating in this meeting were prestigious educators from Bulgaria, Canada, Germany (F.R.), France, India, Italy, New Zealand, Panama (representing UPADI), Poland, Rumania, Switzerland, USSR, United Arab Republic, UK, USA and Venezuela.

Dr. James M. Ham (Canada), was elected President of the Committee and Eng. L. M. Nadeau as Secretary, with Headquarters in the Canadian Council of Professional Engineers, Ottawa, Canada according to the decision of the WFEO General Assembly of 1969. Dr. Ham was then engaged with engineering education as Dean of the Faculty of Applied Sciences and Engineering of the University of Toronto.

The treatment of the Agenda, proposed by WFEO and UNESCO, produced the following conclusions:

i) To establish two working groups, the first to analyze and recommend future joint actions with UNESCO and the second to study the creation of an information service in the field of engineering education, adapted to the needs of the developing countries,

ii) Work with UNIDO and UNESCO in the development of programs on cooperation industry-university,

iii) Organize an international seminar, in cooperation with UNESCO, on the practical training of technical assistance personnel,

iv) To promote the inclusion of studies of administration and economy in the formation of engineers,

v) Elaborate and carry out a survey on facilities for continuing education of engineers,

vi) Create an information-communication network among regional and national committees on engineering education.

The Committee itself considered it convenient to hold annual meetings and proposed a meeting towards the end of 1971

### 1st PERIOD – SECOND MEETING – LONDON 1971

The Second Meeting of the Initial Period of the Committee took place in London in the Headquarters of the Institution of Civil Engineers, the National Member of WFEO, on 29, 30 November and December 1, 1971. Also in this case, UNESCO provided the funds necessary to hold the meeting and was present with the participation of Dr. Alexander Evstafief and Eng. Alan S. Goodyear.

With the presidency of Dr. J. M. Ham from Canada, and the Secretariat in the hands of Eng. L. M. Nadeau, discussions continued on matters dealt with at the Montecarlo Meeting such as: cooperation between educational institutions and industry in the formation of engineers; activities performed by engineers in the industry; methodology for curricular design; information system for developing countries; communication network between the WFEO Education Committee and regional and national committees on engineering education; continuing education; and an approach to engineering education by means of computer engineering.

Besides these subjects, the Committee reviewed the work performed to date and the plans for future activities and approved a „Constitution” that would serve to govern its operations. It also approved the installation of a permanent Regional Committee on Engineering Education in South East Asia as proposed in a recent Seminar held in Indonesia.

According to the Constitution, five members should retire after two years. The WFEO Executive Committee agreed, following the recommendations of the Chairman that the representatives of these countries should retire on December 1972: Italy, France, Germany (FR), Egypt and New Zealand and the National Members of Israel,

Japan, Netherlands, Spain and Tunisia should be invited to nominate „eminent educators” to fill the vacancies.

This meeting was attended by the same Members that were present in 1970, with the addition of representatives from Egypt, Finland and Germany (F.R.).

The final result of the deliberations was to establish four Working Groups to perform studies and provide reports.

Group I	Education – Industry Interface
Group II	Method for curriculum development
Group III	Information System for developing countries
Group IV	Systems – engineering approach to engineering education

All the Working Groups were to produce reports before the end of July 1972, in order to evaluate them at the next meeting of the Committee.

### 1st PERIOD – THIRD MEETING – HELSINKI 1972

In August 1972, FEANI and UNESCO joined to summon a Seminar on Continuing Engineering Education that was held in Helsinki between 21 and 24 August. The opportunity was considered convenient to hold a new meeting of the Committee that was held at the end of the Seminar on August 25 with the presidency of Dr. Ham and the Secretary and with a large participation of educators members and non-members of the Committee that attended the sessions of the Seminar. Also for UNESCO, A. Evstafiev and A. Goodyear participated. For the first time, three members of the UPADI Committee on Engineering Education also participated: Prof. Miguel A. Yadarola (Argentina) who was then President, Dr. Vladimir Yackovlev (Venezuela) also a member of WFEO CET and Prof. Merton Barry (USA).

The following text is the reproduction of the report to the Executive Committee by the

Secretary General of WFEO, Dr. G. F. Gainsborough:

„The discussion centred upon the achievements of the Committee to date and the UNESCO representatives confirmed the value of the Committee with regard to the planning and implementation of the UNESCO programme in engineering education.

At the meeting, it was recommended that the following conditions for holding future meetings of the Committee should be met before a firm date was settled:

- i) The completion of a substantive study, the publishing of which raises well defined issues of stimulating responsive action;
- ii) The prior agreement that a well defined issue for planning or advising justifies the holding of a meeting; and
- iii) The agenda and all supporting documentation be issued well in advance of the meeting.

Consideration was also given to the future activities of the Committee and a development plan, as set out below, was proposed:

- iv) Completion of a reference monograph on „The Design of Systems for Engineering Education – April 1975.
- v) Sponsorship of two UNESCO oriented Seminars on „The Education-Industry Interface” – December 1972 – Africa, Autumn 1973 – Latin America
- vi) Sponsorship of a system-oriented Seminar „Guidelines for the Inception of Programmes of Engineering Education in Developing Countries” – 1974
- vii) Co-sponsorship of a World Congress on Engineering Education – 1975.

Both the conditions for future meetings of the Committee and the development plan were approved by the WFEO Executive Committee when it met in Geneva in September 1972”.

Among the conditions to programme future meetings of the Committee, Dr. Ham mentioned the need to continue receiving the

support of UNESCO or from other sources because for the time being WFEO does not have a budget. Dr. Ham gave more information on the UNESCO Seminars, stating that he personally had been summoned as an Advisor to prepare and submit a background document for discussion at the „Regional Experts Meeting on Cooperation between Educational Institutions and Industry” to be held in Nairobi, Kenya on 11-15 December, 1972 organized by the UNESCO Field Science office for Africa.

This meeting, reports Dr. Ham „is the result of the proposals brought forward by Working Group I created at the Second Meeting in London in 1971. As it was already informed, there was also programmed a meeting in Latin America, in Cordoba, Argentina, where Prof. M. A. Yadarola is a member of the National University besides having been appointed Coordinator representing UNESCO and the Argentine Government for all matters concerning the organization”.

Prof. Yadarola completed the information: „The First Latin American Seminar on Cooperation between Educational Institutions and Industry in the Formation of Engineers will be held on May 6-12, 1973 organized by the UNESCO Regional Office of Science and Technology for Latin America and the Caribbean in association with the National University of Cordoba. In support of the Seminar, UNESCO has summoned Dr. V. Yackovlev who is a Member of the WFEO-CET as an Advisor to prepare a document that contains all the existing background information to serve as a guide for the guest Experts”.

The Fourth Committee Meeting of this first period could not be programmed on this opportunity. Dr. Ham expressed that it was an aspiration of the WFEO Executive Committee and also of some of the members, that the meeting be held in New York, in September 1973 when the WFEO General Assembly takes place in that city but there were financial aspects to be solved before taking a decision. No financial support has been granted by UNESCO.

### III. THE COMMITTEE REMAINS INACTIVE FOR A PERIOD OF THREE YEARS (1973-1975)

After the meeting held in Helsinki in 1972, the Committee lost its initial energy and no action has been registered for the following years: 1973, 1974 and 1975

President Dr. Ham and Secretary Eng. Nadeau made several attempts before UNESCO to obtain continuity in the financial support for the Committee, that until 1972 allowed assuming partially the costs of participation of those members who were not in a position to personally pay for their traveling and lodging expenses. Neither did they obtain results with the request that Dr. Ham made to the National Members that had appointed members for the Committee and some of them sustained that the Committee should be self-supporting, others that financial aid should be obtained from international organizations such as UNESCO or else seek the support of universities, engineering societies or large industrial companies such as SEFI.

Finally, during the first months of 1975 Dr. Ham informed the President of WFEO of his intention to resign to the presidency of the Committee, with the argument that it was impossible to continue assuming the responsibility of leading this important working group of WFEO without the adequate financial support.

Dr. Ham's decision prompted WFEO to send via telex a communication to all National Members asking those that were in a position to assume the responsibility of being Headquarters and nominating a President for the Education and Training Committee, to present a proposal that could be analyzed during the next General Assembly.

At the 5th WFEO General Assembly in Tunisia, 1975, the Secretary of the CET, Eng. L. M. Nadeau officially presented Dr. Ham's resignation together with a report where he pointed out the items that were on the Agenda of the Committee for further study.

- i) Career pattern of graduates
- ii) Problem of mutual recognition of engineering qualifications
- iii) Study of the potential for development of individual subjects, e.g. mathematics, design
- iv) Problems in the development of staff for schools of engineering
- v) The role of engineering education in national development
- vi) Engineering education and the environment

#### **IV. THE COMMITTEE IS RE-ORGANIZED – NEW PERIOD – IN INDIA HEADQUARTERS**

The decision of the Institution of Engineers, India, to host in their Headquarters at Calcutta, 8 Gokhale Road, the WFEO Committee on Education and Training, meant contributing to this Committee, an institutional and economic support that was the initial basis for growing development and an internationally acknowledged and valued activity.

The Presidency was entrusted by the WFEO General Assembly in Tunis 1975, to Dr. Eng. Amitabha Bhattacharyya a renowned educator that had earned the confidence of the Institution when he was its President and also as a Production Engineer and University Professor. Not less important was the function of the Secretary, assumed by Colonel Eng. Baguan Nagrani, who was also Secretary of the Institution.

The initial task that both President and Secretary imposed upon themselves was to re-organize from the bottom, the structure and membership of the Committee, inviting as members of the Committee, relevant engineers, educators with a vocation for working together internationally, that were also representatives of the academic sector of their countries.

#### **FIRST MEETING – NEW DELHI 1976**

When the President of the Committee summoned a first Meeting, of the New Period in

its Headquarters in New Delhi on 24-27 April 1976, the following Members were incorporated: A. Blazej (Czechoslovakia), V. Bolotin (URSS), J. Brown (U.K.), I. Gerendas (Hungary), L. P. Grayson (USA), J. E. Jansson (Finland), J. Karni (Israel), M. Latiri (Tunisia), T. Osatake (Japan), M. Woelde-Amiak (Ethiopia), D. Mordell (Canada) and A. Evstafiev (UNESCO). All of them also participated in the UNESCO „International Conference on Education and Training of Engineers and Technicians” that was held in New Delhi between 20-26 April 1976, which meant an attraction for those that had accepted Dr. Bhattacharyya's invitation to become Members. The Conference was highlighted by the amount and quality of the Conclusions and Recommendations approved, many of which became objectives and aims for the Working Plan of the Committee.

A modality that was put into practice at this meeting in New Delhi consisted in dividing the deliberations into two Sessions: one open to the participation of non-member experts who were able to express their points of view and discuss them with the Members. Afterwards, these open meetings were transformed into Round Tables, Seminars and Symposiums. The other Session was restricted to the Members to allow them to elaborate recommendations and strategies for action and propose the performance of studies and works.

– Creation of Task Forces: At this meeting, the Committee decided to create two Task Forces to deal with:

TF1: The evaluation and mutual recognition of engineering qualifications awarded in different countries and

TF2: Building up a suitable educational and training pattern to suit the challenges and tasks of the engineers of the next century.

– Invitations to join the Committee: After the meeting, the President, with the support of the Headquarters decided to invite to form part of the Committee, educators from other countries, proposed by the Member Organizations of WFEO. During the first months of

1977, J. Timowski (Poland), A. Ferrari-Toniolo (Italy), M. A. Yadarola (Argentina) were incorporated.

## **SECOND MEETING – WARSAW – 1977**

Warsaw, June 18-20, 1977 was the venue for the Second meeting of the Committee. The Polish Federation of Engineering Associations (NOT) was the Member Association of WFEO that hosted the Committee as well as the WFEO 6th General Assembly that deliberated between 20 and 23 June.

– Report of the Task Forces. The work performed by the two Task Forces was received and-discussed taking up one of the Sessions. In the other Working Session the papers submitted by the members, concerned with the co-operation between industry and university were discussed. The Recommendations approved expressed the concern of the Members, in the face of the reality existing in an evident lack of co-operation between the two sectors. It was decided to prepare a comprehensive report with suggestions of corrective measures. Dr. Donald Mordell and Dr. Vladimir Yackovlev were in charge of this report.

– Place for the next meeting. Unanimously the Members decided to privilege Africa for the next Annual Meeting and accepted the offer of the Member Organization of WFEO for Libya to hold jointly in Tripoli, two round tables and a Seminar.

## **SPECIAL MEETING AT UNESCO HEADQUARTERS – PARIS – 1978**

The President and the Secretary of the Committee were invited by the Director General of UNESCO to participate on April 11-14, 1978 in a meeting of the officers of International and Regional Non-Governmental Organizations concerned with the education of engineers and technicians. Also invited to this meeting was Prof. M. A. Yadarola in his position as President of the UPADI Committee on Engineering Education. Prof. Yadarola

at the time, was also President of the Argentine Federation of Engineering Societies (UADI). UN Specialized Agencies such as UNIDO and ILO, plus as observers: ICSU and IAU also participated. The objectives of the meeting were:

i) Review of objectives, structure and activities of participating Organizations

ii) Review of the educational system for engineers and technicians in countries and regions. Trends for the future.

iii) Review of UNESCO Programs on technological education and research

iv) Ways to improve the co-operation of UNESCO with the NGO's: Funding Regional Meetings and Newsletters – Organization of short term courses on Education and Industry Co-operation – Better teaching methods – Methodologies for Curricular Design – Increase Regional Programs for the exchange of Professional Students – Role of Research

v) Promote the creation of Registration Boards

vi) International Co-operation between participating Organizations.

The report of the WFEO Committee was presented by Col. B. T. Nagrani. Dr. Bhattacharyya was elected Vice President of the meeting that was chaired by Prof. K. Ovensen (SEFI). WFEO and CEC were the only NGO's with a worldwide scope. The rest of the participants were representing regional organizations. The reports were presented by: CEC Eng. M. W. Leonard, FEANI Prof. U. Mocafico, UPADI, Prof. M. A. Yadarola, FAE Dr. A. El-Erian, FAOE Dr. M. Selim, CEEMA Dr. S. Talitwala, AEESEA Dr. Ki Jun Lee, COPISEE Dr. A. Protopapas, SEFI Mr. G. Fagniere.

The meeting agreed on important recommendations addressed to UNESCO and others aimed at strengthening the co-operation between the different NGO's concerned with the education of engineers.

## **THIRD MEETING TRIPOLI – 1978**

The Third meeting of the WFEO-CET was held in Tripoli, Libya between September 6-

10, 1978, hosted by the Libyan Association of Engineers and Technicians (today, the Libyan Syndicate of Engineers), that took upon itself all the local expenses of the participants and also contributed support for traveling expenses to several of them. The meeting was meant to open the doors to the concerns of Africa for a WFEO Standing Committee.

It was not the first time that WFEO was present in an African country because in June 1975, the 5th General Assembly had met in Tunisia and since then an eminent Tunisian engineer, Sadok Ben Jemaa had assumed the presidency of the organization.

Contemporaneously with this Annual Meeting of Tripoli, a Seminar and two Round Tables were performed that were honored with the presence of several educational leaders from Africa. Dr. S. B. Lswakabamba (Tanzania), Dr. M. M. Aswed and Dr. M. H. Elwany (Libya), C. Ntambi (Uganda), A. S. El Hakeem (Sudan), K. F. Jean (Ivory Coast), F. O. Kwami (Ghana). Also from Asia, Dr. Mazhar Ali Khan Malik (Pakistan) and R. Venkataramani (India).

– Seminar „Improving the indigenous engineering capabilities of Developing Countries”. Several valuable papers presented contributed to important Concluding Remarks, that were registered by the Rapporteurs Mr. Alan Goodyear (UNESCO), M. Leonard, D. Mordell and M. A. Yadarola. They could be considered as programs for the educational institutions and the professional societies for strengthening indigenous technological and engineering capabilities and the role of engineers in each country, not only in Africa, but in many developing countries.

– Round Tables. The following Round Tables completed the programme of meetings performed to complement the meeting of the Committee:

– Round Table I was held under the chairmanship of the Minister for Planning of Libya and focused the discussion on „Mechanisms of assistance to African countries from

UN and WFEO in Engineering Education”. The participants also stressed the importance of cooperation among the nations in Africa.

– Round Table II dealt with the „Mechanisms of reporting significant trends in Engineering Education from different countries”. It was chaired by Dr. M. M. Aswed, Dean of Engineering, El-Fateh University, Tripoli.

– 3rd Annual Meeting of the Committee on EE&T. The progress reports of the two Task Forces were reviewed and an analysis was made of the way of involving the Committee in:

i) Multilingual Glossary of Terms related to the education of engineers. A project was endorsed to the Member V. Bolotin,

ii) Guide of NGO's professional institutions and their activities on Education and Training. Prof. A. Ferrari Toniolo with the help of UNESCO

iii) Survey of conditions of employment of young engineers at the point of entry into the profession. Prof. J. Tymosvsky was entrusted with the task of preparing a questionnaire

iv) Role of mathematics in the contemporary engineering education and training. Dr. V. Bolotin, responsible to develop this project suggested that a special Seminar could be organized by VSNTTO in the USSR in 1979 simultaneously with the meeting of the Committee.

The varied programme of social events organized by the Libyan engineers allowed starting off authentic comradeship between the Members of the Committee: a formal dinner and another with Arab dancers and a lunch with everyone seated on silk carpets under the shade of olive trees in the midst of a desert.

#### FOURTH MEETING – TASHKENT – 1979

1979 was a very busy period for the Committee, because a first meeting was held at the proposal of Dr. V. Bolotin in Tashkent, Uzbekistan, USSR on May 13-15. The sec-



and one, had to coincide with the General Assembly of Jakarta, Indonesia in November.

The Fourth Meeting at Tashkent coincided with the deliberations of the „Seminar on Mathematical Education of Engineers”. The organization and all the lodging and traveling expenses of the Members of the Committee from Moscow to Tashkent, were kindly financed by VSNT0 the engineering federation representing the USSR in WFEO.

The following Members participated: Dr. A. Bhattacharyya (President), Col. B. T. Nagrani (Secretary), D. Mordell, J. Timovsky, M. A. Yadarola, A. Ferrari Toniolo, V. Bolotin, A. Blazej and the new Members: Lazlo Felfoldi (Hungary), Eric Storr (Australia). There were also several Observers from VSNT0 and the local engineering organizations of Tashkent.

– Seminar on Mathematical Education. The meeting concluded that engineers should be formed with strong knowledges in mathematics, allowing them to:

i) Explain the nature of maths as a logical mental structure, using symbolized language, and to explain the concept of maths model

ii) Present natural and technical phenomena with maths models, and to use them in planning and in describing production processes and their effect

iii) Perform guide, control and plan maths solution models in cost estimation, planning, quality control, forecasting, etc.

iv) Choose an appropriate numerical method

v) Explain the general nature of natural and technical sciences, and to describe the main characteristics of the methods used by them.

– Reports of the Task Forces. The reports of those responsible for the Task Forces and the projects identified in Tripoli were dealt with. Also talks were commenced there on:

i) Mutual Recognition of Qualifications

ii) Performance of a World Conference on Engineering Education for the Future

iii) Preparation of a Reference Book on the Constraints and Restraints of Professional Practice of Engineering in different countries

iv) Coordination with UNESCO Working Groups on Engineering Education.

The Meeting of the Committee took up 13 and 14 May, together with technical visits, social and tourism activities. The visit to the legendary City of Samarkand, that in the XIV Century was the Capital of the Empire of Tamerlan deserved a special mention. Visits to the Mesquite of Telka Kare and the constructions made in the IV Century by the renowned astronomer Ulugh Beg.

### FIFTH MEETING – JAKARTA 1979

The Meeting of Jakarta, Indonesia was held between 7-9 November, 1979 and was sponsored by the Persatuan Insinyur, Indonesia, a Member Organization of WFEO and took place contemporaneously with the WFEO 7th General Assembly that was held with the sponsorship of H. E. the President of the Republic of Indonesia.

Relevant aspects of of the meeting organized simultaneously with the 7th GA were a series of Round Tables and Technical Seminars, organized separately by the three Technical Committees of WFEO: Engineering Information, Transfer of Technologies and Education and Training. The special characteristics of these technical meetings and also the annual meetings of each WFEO Committee, allowed a very fruitful interrelationship towards a well coordinated task in many subjects in common.

Round Table: „Education and Training Problems of Interest to Indonesia” As basic paper, an extraordinary presentation by Dr. A. Bhattacharyya, reflected the problems of the Developing Countries in general. This presentation was published in a pamphlet that was widely diffused.

The 5th meeting of the WFEO CET was held at the Palace of the Ministry of Education of Indonesia with the participation of the Minister himself at the Opening Session.

The deliberations concentrated on the analysis of several subjects:

- i) Glossary of Technical Terms. A first version in English, French and Russian languages was presented and discussed.
- ii) Constraints and Restraints to Professional Practice,
- iii) Guide Book on NGO's concerned with EE
- iv) The first answer to the questionnaire on survey of the conditions of employment of young engineers and
- v) The organization of a World Conference on EE in Buenos Aires, that was entrusted to the Committee Member for Argentina, Prof. M. A. Yadarola.

The meetings of the WFEO Executive Council and the 7th General Assembly, were attended by Prof. Yadarola in this case as President of the WFEO Member for Argentina, UADI trying to make a new WFEO Committee to be created, Engineering and Environment be hosted by Argentina with the presidency of the eminent engineer Conrado Bauer. This was achieved as also that the 8th General Assembly be held in Buenos Aires in 1981.

#### **SIXTH MEETING – CARACAS – 1980**

The first meeting of the Committee, of this India Period in the American Continent, was programmed to be held in Caracas, Venezuela under the sponsorship of the „Colegio de Ingenieros de Venezuela” between 10-11 October 1980, contemporaneously with the Meeting of the WFEO Executive Committee that year.

The Opening Session of the WFEO CET meeting in Caracas started on the morning of October 10 and was honored with the presence of the President of WFEO S. Ben Jemaa, the President of the „Colegio” Eng. J. L. García González and several Engineering Deans from the country. Representing UNESCO was Eng. Carlos Nones Sucre. Also present was a large group of engineers and professors from the universities, attracted by the open session at

which all those present could express their opinions regarding the subjects of the Agenda of the Committee. This first session lasted all day, having heard several opinions that were registered by the Secretary Col. B. T. Nagrani to be used as a starting point for the session of the following day.

The 6th Meeting of the WFEO Committee CET was held on October 11. Analyzed there were the following themes:

- i) Electronics and Concepts of Environmental Engineering as Core Subject of the Degree Level in Engineering
- ii) Exchange of Experts to Improve Engineering Curricula
- iii) Correspondence Courses for practicing Engineers who cannot afford Continuing Education,
- iv) Research for Innovative Types of Continuing Education for practicing Engineers
- v) Project-Oriented Learning Schemes at Graduate Level
- vi) Development of Guidance and Pre-college Systems Approach
- vii) Career Training Programs as a Pre-requirement for practice.

#### **MEMBERS OF THE COMMITTEE AT THE GLOBAL SEMINAR IN NEW DELHI**

Summoned by The Indian Science Congress Association (ISCA), Indian National Science Academy (INSA) and The American Association for the Advancement of Science (AAAS), during December 1-5, 1980 a „Global Seminar on the Role of Scientific and Engineering Societies (ES) in Development” was held in New Delhi.

The Global Seminar had the following objectives:

- i) Analyze successful (and non) activities of ES and present current of thinking regarding their contribution to Development
- ii) Identify activities that ES can contribute in each country for Development
- iii) Cooperative areas

- iv) Planning a few high priority projects,
- v) Energize ES not yet involved in Development.

Dr. Bhattacharyya was invited to present a paper on: „Monitoring Access Mechanisms for Higher Scientific and Technical Education”. Also invited: the Secretary, B. T. Nagrani presented „Technical Information – The Vital Element of all Development”, finally Prof. M. A. Yadarola, „Schemes for the Strengthening of Professional Societies as an Active Part of the Scientific and Technological Infrastructure of the Countries”.

WFEO sponsored the Seminar and was present in the words pronounced by the Secretary Mr. Claude Herselin „Role of Engineering Societies”. The Seminar produced a select group of Recommendations whose diffusion was requested to organizations of a world wide scope such as ICSU and WFEO. The meetings in New Delhi allowed the Members of the Committee present and officers of the WFEO ExCo to exchange ideas on how to strengthen Member Societies and Technical Committees.

### **SEVENTH MEETING – BUENOS AIRES – 1981**

The 8th WFEO General Assembly was decided upon unanimously in Jakarta, to be held in Buenos Aires, Argentina between 15-20 November, 1981, together with the WFEO Technical Committees, two Seminars, two Round Tables, the First World Congress on „Engineering and Environment” and the

– „World Conference on Educating Engineers for the Next Century”. The direction of the Organizing Committee of the Conference was entrusted to Prof. M. A. Yadarola who was also elected President of the Conference, together with Dr. Bhattacharyya and Prof. T. Osatake who acted as Vice Presidents. At the Conference 42 papers were submitted and exposed that were analyzed by more than 200 participants of which 38 were from other countries. At the Opening Ceremony, renowned speeches were heard from the Minister of Education of Argentina, the President

of the Rectors Council, the President of the Committee, Dr. Bhattacharyya, the Director of the Engineering Education Section of UNESCO, Paris Dr. Alan Goodyear and the President of the Conference, Prof. Yadarola.

The Conclusions and Recommendations were the fruit of the participation of experts from 24 countries that elaborated knowledgeable criteria within the scope of the four Topics identified to discuss the Main Theme:

- i) Education of Engineering in the Cultural and Socio-Economic Context of the XXI Century,
- ii) Characterization of Twenty First Century Engineers, iii) Teaching Institutions of the Next Century, iv) Training of Teachers for the Next Century.

The 7th Meeting of the WFEO-CET was held on November 18 with the following Agenda:

- i) Education and Industry
- ii) Education and Role of Technicians in the Engineering Workforce
- iii) Comparability of Engineering Qualifications and Practice
- iv) Policy for Future Engineering Education Conferences
- v) World Scale Alliance for the Development of Scientific and Engineering Education. The discussion of this last theme was performed on the basis of a similar Proposal that the Member for Argentina, Prof. Yadarola had presented in 1980 to the US Council of Engineering Deans in San Antonio, Texas where he was invited representing the UPADI Committee on Engineering Education.

### **FIRST WFEO INTERCOMMITTEE MEETING – BUENOS AIRES 1981.**

The presence in Buenos Aires of all the WFEO Committee Chairmen, provided an excellent opportunity to analyze jointly the operation of these WFEO working forces. The meeting was held on November 20 and was presided by Dr. Robert A. Frosch with the participation of Mme. A. David, Engi-

neering Information & Documentation. Dr. A. Bhattacharyya, Education and Training. Eng. C. E. Bauer Engineering and Environment. Eng. Hakimi, Transfer of Appropriate Technology. Eng. S. Herrera, acting for Eng. Calvado, Energy.

The participants agreed that:

i) In the creation and integration of any new WFEO Technical Permanent Committee the G.A. must ensure that both the President as well as the proposed members be experts with real interest in cooperating and participating in a continuous manner.

ii) The Members that nominate a representative in the Committees, should ensure appropriate support of the work and a reasonable stability in the representation.

iii) The Committee Chairmen wish to have more participation in the discussion on the allocation of funds to each Committee and that the budgets are related to the activities that need financial support.

iv) Conscious coordination between the topics of Congresses and the subjects of works being undertaken by each Committee. The number of Congresses in coordination with the GA, should be limited.

v) The number of Permanent Committees should be limited to areas where policies of WFEO are necessary in a permanent way.

vi) The rules for the Operation of the WFEO Committees should be updated. Several suggestions were made to the GA.

The participants expressed the convenience of continuing with these joint meetings because they allow WFEO to work in a coordinated manner on technical matters common to the themes of the Committees. Also, that in these meetings, members of the WFEO Executive Committee should participate.

### **INTERNATIONAL EXHIBITION: „ENGINEERING, INDUSTRY AND DEVELOPMENT"**

Organized by UADI, the Argentine Member of WFEO and sponsored by the Govern-

ment, Industrial Chambers and Professional Societies an International Exhibition was held in the city of Buenos Aires and open to the public between 14-28 November, 1981. The visitors were able to appreciate important advances in the industries of several developed countries as well as in Latin American countries with special emphasis on the Argentine industries.

### **EIGHTH MEETING – BELGRADE – 1982**

The 1982 Annual Meeting of the Committee was held in Belgrade, Yugoslavia, on October 11,12, 1982 organized by the Yugoslavian Association of Engineers and Technicians, a Member institution of WFEO that took upon itself all the lodging expenses of the Members of the Committee and UNESCO and UNIDO guests. Prof. Zvonimir Radic in the name of the Association prepared a complete program for the working sessions and for the cultural and social events.

Members of the Committee representing Argentina, Canada, Czechoslovakia, France, Hungary, India, Italy, Libya, Tunis, Yugoslavia participated. Representing UNESCO, Dr. Alan Goodyear and for UNIDO, Dr. Alexander Evstafiev, who attended the first meeting of the Committee representing UNESCO.

At the meeting matters of interest were considered, contributed by several participants and an extensive agenda:

i) Revision of the Rules and Procedures for the Committee

i) Regional UNESCO/UNIDO/National Engineering Organizations Seminars

ii) Identification and assessment of the education and training needs of industry and government in different countries

iii) Proposal from Guyana to organize a meeting to analyze long-term objectives concerning education and training and the nature of help the developing countries would need.

– National long-term actions on engineering education. There was agreement that the definition of national long-term actions concerning engineering education and training, can no longer remain the prerogative of political or university powers. National Engineering and Technical Societies ought to be consulted and then proposals should be taken into account. Furthermore, national development cannot be brought about by a simple transfer of „outside” technology, however adapted this might be. National Development depends on policies defined by each State, drawing on the country's own vital resources and the cultural, economic and social conditions. The Committee approved a project for the submission of this opinion to national and international organizations.

– Other themes of the Agenda were discussed: The members also analyzed these aspects:

i) International mobility of engineers and the problems of reciprocity. The Committee decided to propose: – that a catalogue be drawn up, listing the conditions of access for engineering practice in each country member of WFEO and the existing restrictions for foreign engineers – that intergovernmental contacts be established under the sponsorship of UNESCO for the implementation of international mobility. vi) Formation of tertiary consulting units in different countries to provide liaison between universities, industry and government. The Committee voted against this proposal considering that national engineering societies are the natural intermediaries for these three sectors.

ii) Use of educational technology in engineering education. On this point, the Conclusions and Recommendations of the UNESCO-UPADI-UNSJ Seminar on New Methods for Engineering Education held a few days before in San Juan, Argentina (October 4-8, 1982) were very opportune. The Committee decided to propose that WFEO raise the interest of a National Engineering Society, Member, to organize an International Conference on the same main theme.

## NINTH MEETING – NAIROBI – 1983

For the first time a country of Equatorial Africa, Kenya invited WFEO to make its capital, Nairobi the headquarters of the 9th General Assembly, the meetings of the Technical Committees, and the „International Conference on the Role of the Engineer Towards Peace and Prosperity” that was held on 13, 14 October, 1983 at the Kenyatta International Conference Centre in Nairobi, Kenya.

Many distinguished personalities from the five continents participated in this Conference organized by WFEO and The Institution of Engineers Kenya with the support of international governmental organizations such as: UNESCO, UNIDO, UNEP, FAO, ILO, UNCHS, ACCT and several non governmental organizations.

Several members of WFEO CET participated in the Conference presenting invited papers.

The Ninth Meeting of the WFEO CET discussed an ample Agenda considering papers and reports prepared for its members.

i) Need for Systems approval in Development Guidance and Counselling of Pre-College Engineering Students, presented by Prof. Lazlo Felfoldi, Hungary.

ii) Task Force Report on Needs and Aspirations Levels of Developing Countries by Prof. Mokhtar Latiri, Tunisia and Prof. Miguel A. Yadarola, Argentina.

iii) Educational Technology in Engineering Education by Dr. Donald Mordell, Canada.

iv) Resource Book of Personnel in the Area of Education and Training by Mr. Michael Leonard, United Kingdom.

v) Employment Conditions of Young Engineers at the Point of Entry in the Profession vis-à-vis The Societal Status of Engineers by Prof. Janus Tymowski, Poland.

vi) Cooperation between Professional Institutions, Educational Institutions and Industry by Prof. M. A. Yadarola.

vii) Results of the Questionnaire and Sur-

vey on Labour Safety Training – Its Inclusion in Engineering Curricula by Prof. Lazlo Felfoldi.

viii) Consideration of UNESCO Medium-Term Plan (1984-89) on Cooperation in Engineering, Science and Technology.

Several of the above reports could not be analyzed in detail due to lack of time and remained pending for the Agenda of the next meeting of the Committee.

### TENTH MEETING – PRAGUE – 1984

The Committee session took place at the Rectorate of the Prague Technical University on 6, 7 July 1984. The organization of the meetings, reception of participants, their lodging expenses and the agenda of the social and cultural events was undertaken by the Member of WFEO, the Czechoslovak Scientific and Technical Society – CSVTS.

The meeting had the participation of the Committee Members from Hungary, Canada, Poland, Tunis, Argentina and Prof. Anton Blazej from Czechoslovakia. Also present were numerous guests from the host country and the following new Members nominated by the National Members of WFEO: Prof. Vin Novikov, USSR, Prof. Lu Quian, China and John Anthony Perrington, UK. The following also give hierarchy to the meeting: Mr. Robert Bureau, Secretary General of FEANI, Prof. Alan Goodyear of UNESCO, Dr. Alexander Evstafiev representing UNIDO and Eng. A. L. Titchner, New Zealand.

The President of the Central Council of CSVTS, Dr. Breislav Benda and Prof. Jiri Pejka Rector of the Technical University of Prague pronounced words of welcome which were thanked by the President of the Committee Dr. A. Bhattacharyya. The President read a message for the Committee and CSVTS from WFEO President Eng. Sadok Ben Jemaa and Secretary Claude Herselin.

Many of the themes that were part of the Agenda of this meeting were the continua-

tion of the discussions of the meeting in Nairobi, 1983. The presentation and comments generated by the following papers awakened the interest of participants and guests:

i) Priorities Needed to Support Successfully the Education and Training of Engineers – by Dr. Donald Mordell, Canada.

ii) Present Situation and Development of Continuing Engineering Education in China, by Prof. Lu Quian.

iii) Continuing Education Activities of the USSR Scientific and Engineering Societies by Prof. V. N. Novikov.

iv) New Focus on Cooperation Between Professional Institutions, Educational Institutions and Industry, by Prof. A. L. Titchner, New Zealand.

Besides, the Committee analyzed and discussed the following:

v) Establishment of Regional Networks for Exchange of Information and Topics of Special Interest to Education and Training and Formation of Tertiary Consulting Units in Different Countries to provide Liaison between specific Universities, Industry and Government.

vi) Guide book on „Non Governmental Organizations dealing with Engineering Education and Training of Technicians.

vii) Glossary of Technical terms for use in Engineering Education and Training in English, French and Russian. A Spanish version was endorsed to Prof. Yadarola.

After the meeting of the Committee and having participated in relevant cultural and social activities, the participants went to the city of Bratislava to take part in an International Conference.

– International Conference on Progressive Methods, Forms and Technical Means in Engineering Studies, Bratislava, July 9-12, 1984. The Conference was organized by the Slovak Technical University jointly with CSVTS and was attended by many educators from Czechoslovakia and other countries of

Europe besides the participants of the Prague meeting.

The papers presented at the Conference were printed by CSVTS and sent to all participants.

### **ELEVENTH MEETING – NEW DELHI – 1985**

The Institution of Engineers India and WFEO had organized the Second World Congress on Engineering and Environment in New Delhi on November 7-9, 1985 with the Main Theme: „Technology for a Better World Environment”.

Advantage was taken of the opportunity of this important meeting by the President Dr. A. Battacharyya who decided to summon the 11th annual meeting of the CET on 8-9 November, 1985.

New Delhi was also the site for the 10th General Assembly of WFEO that met on 11-13 November and the meetings of the remaining Technical Committees, especially the WFEO Committee on Engineering and Environment chaired by Eng. Conrado Bauer, who was responsible with IE India for the World Congress.

– The demise of Prof. Ferrari Toniolo. Prior to the commencement of the meeting, the participants paid homage to Prof. Andrea Ferrari Toniolo (Italy) deceased in March 1985 in remembrance of his valuable cooperation since his incorporation in September 1978.

– Reports of the members of the Committee: During the meetings of the CET several Reports were presented:

i) The role of Functioning of Scientific and Technical Information Systems in Engineering Institutions – Eng. Pierre Pecoux, France.

ii) Bangalore Conference on Science and Technology Education and Future Human Needs (1985), Dr. M. P. Chowdiah, India

iii) Environment in Technology and Engineering Education – Eng. Conrado Bauer, Argentina.

iv) The action of UPADI in Engineering Education through eleven Pan American Congresses – Prof. M. A. Yadarola, UPADI Committee on EE.

v) Engineering Education in Developing Countries – Seminar of the Commonwealth Engineers Council, Sri Lanka 1985 – Eng. A. M. McKay – Secretary.

The members of the Committee had the opportunity of participating in the Opening and Closing Sessions of the 2nd World Congress and also in the social meetings, technical and sightseeing visits in New Delhi. They were also able to opt for tourist trips to Agra, Kajurao, Varanasi, and Jaipur.

An outstanding aspect of the meetings organized by the IE, India and WFEO was the „Exhibition of Technical Equipment and Books on Environmental Issues” held on the opportunity of the Congress.

### **TWELFTH MEETING – BEIJING – 1986**

Organized by the Chinese Member of WFEO, the China Association for Science and Technology (CAST) the meeting of the WFEO CET was held jointly with the meetings of the Executive Committee at the Friendship Hotel of Beijing between September 27 and 29, 1986. The Chairman of the Organizing Committee, also Vice President of WFEO, Mr. Zhang Wei was the person in charge of the welcoming in the name of CAST and the Government. The President of WFEO Mr. Sadok Ben Jemaa thanked him for the Chinese hospitality.

The President of the WFEO Committee on E&T Dr. Bhattacharyya in his summons to this meeting justified the place elected for two important reasons:

i) CAST the host organization took upon itself all the lodging, expenses and prepared a varied cultural and sightseeing programme for all WFEO participants.

ii) Three members of the Committee, Dr. Anwar Hossain, Prof. Miguel A. Yadarola and the President are also Members of the

WFEO Executive Committee, which facilitates complying with both obligations.

The Agenda sent by the Secretary of the Committee, Prof. D. K. Ghosh in April 1986, prior to this meeting, concentrated on the organization of the Committee with a view to electing a new President for the WFEO CET at the General Assembly in Vancouver, besides analyzing Internal Regulations for the operation of the Committee and an evaluation of the Newsletter that the Committee publishes with the financial assistance of UNESCO and the technical support of the Institution of Engineers India.

- The Newsletter of the Committee. According to the President Dr. Bhat-tacharyya the Number 1 of the Newsletter was published in September 1976 and so far 40 issues have been published with a periodicity of four numbers a year. The President said that the Newsletter originally included information related to international meetings on engineering education, the announcements, conclusions and recommendations and progressively papers written by the Committee Members or by personalities in education were included. The discussion centered mainly on the dissemination modality of the Newsletter:

i) Prof. Felfoldi (Hungary) suggested printing additional copies to have a wider circulation and approach to as many engineering educators as possible.

ii) Dr. Anwar Hossain (Bangladesh). Better to send copies to the Headquarters of professional societies or their branches and receive a realistic picture of the themes most appreciated.

iii) Prof. Lu Quian (China). Organizations that have a real interest in receiving copies should be identified and subsequently mail copies to them.

iv) Dr. Donald Mordell (Canada). Efforts should be made to contact Faculties of Engineering in each country and UNESCO should be approached for financial support of the activity.

v) Dr. James Oldsue (USA) agrees that Corresponding Members of the Committee, not

only Full Members, should be the connection of the Committee with education and training in each country.

vi) Prof. Miguel A. Yadarola (Argentina). Tells about his experience as Editor of the Newsletter „Enseñanza-Engineering” that UPADI Committee on Engineering Education publishes, also with the financial support of UNESCO. 1500/2000 numbers are published for each issue with a periodicity of two numbers per year. The largest expense is the mailing, although it is accepted as „Printed Matter”. There are several organizations in UPADI that accepted to assume the mailing costs to Educational Institutions in their countries and this improved the economic equation. He suggests that something similar be done with the WFEO Committee on E&T Newsletter.

The members of the Committee on E&T and the WFEO Executive Committee were invited to visit the Great Wall, the Imperial Palace, the Forbidden City with its magnificent gardens, the Temple of the Heavens and the Tomb of Ming. All these places were full of Chinese tourists, especially children and young people because it was the 1st. of October, a National Holiday. The organizers also programmed a brilliant spectacle of music, ballet, martial arts and acrobatics at the principal theatre in Beijing. They also visited the Tianamen Square with its imposing public buildings.

### THIRTEENTH MEETING - VANCOUVER - 1987

The 13th Meeting took place in Vancouver, Canada sponsored by the Canadian Council of Professional Engineers CCPE simultaneously with the 11th WFEO General Assembly and with a „Workshop on „Environmental Education for Engineers” organized by the two WFEO Committees „Education” and „Engineering and Environment”. All the meetings were held at the Westin Bayfront Hotel at a place with a magnificent view of the port and the English Bay.

The 13th meeting of the WFEO CET was held on May 25, 1987 and commenced with



the approval of important matters related to the internal organization and the future Headquarters and Presidency of the Committee.

– Internal Rules of Procedure. The text was proposed by the WFEO Executive Committee. President Dr. Battacharyya had worked with the ExCo on this text and for this reason, after explaining its most relevant aspects, it was unanimously accepted. Relevant aspects:

i) The WFEO Member Organizations, wishing to participate in the work of a particular Committee shall submit to its President the names and CV of persons who are very active in the field. The President shall select those he recommends and the appointment of the Full Members shall be made by the ExCo.

ii) The name of the President shall be recommended by the Committee and the appointment shall be decided by the ExCo for a four-year term renewable once. The process of appointment or re-appointment should be made at least one year in advance. These dispositions of the Regulations condition the following points of the Agenda, stated the President.

– The Election of a New President for the WFEO CET. At the previous meeting in Beijing Dr. Bhattacharyya had announced his wish to leave the presidency of the Committee after twelve years of work (1975-1987). To fulfill his retirement at this meeting in Vancouver he asked the Full Members who had an interest in occupying the presidency to have their names proposed through the National Member of WFEO. Four Candidates were proposed: 1) Prof. Miguel Angel Yadarola for UADI, Argentina; 2) Prof Dr. Anwar Hossain for IE Bangladesh; 3) Prof. Acad. Anton Blazej CSVTS Czechoslovakia; 4) Dr. Karl Willenbrock for AAES, United States. All the persons proposed showed important experiences in the management of professional societies. The proposal were supported by renowned Institutions.

After a recess where the members of the Committee exchanged opinions the meeting

started again submitting the following proposal:

i) That in the Internal Rules of Procedure there exists a new methodology for the election of a new President: he should be proposed by the Committee a year in advance for his appointment by the WFEO Executive Committee

ii) Leave the proposal of a new President until the next meeting at Kathmandu

iii) Request Dr. Battacharyya to continue as President for another two years, until the next WFEO General Assembly in Prague, 1989.

The proposal was approved unanimously and the occasion was propitious to point out the outstanding and meritorious task performed by Dr. Battachayya at the head of the Committee. The President expressed his gratitude for the confidence deposited in him, and asked the four colleagues proposed for the election of a new president to accompany him together with the present Secretary Eng. K. N. Majumdar, to form part of the Board of the Committee as established by the Internal Rules.

– Future activities. The Committee continued the sessions discussing at length various projects and technical activities:

i) A fairly extensive programme on non-formal education

ii) Dynamics of curriculum development

iii) Safety practices in engineering

iv) Education Technology

v) Motivation of engineers

vi) Criteria for faculty selection for technical universities

vii) Technology and education for rural areas.

– First World Congress on EE&T. The Committee was informed of the Theme, Organizing Committee and different aspects related to the First World Congress on Engineering Education and Training to be held in November 1988 in Kathmandu, Nepal, organized by the Nepal Engineers Association

(NEA) with the strong collaboration of the Headquarters of the Committee in India. Dr. Bhattacharyya especially invited the members of the Committee to participate and to diffuse the Congress in their countries and regions.

The social and tourist activities of the Vancouver meeting, included a dinner in the evening, on a ship that sailed through the Strait of Georgia facing the city and the north coasts, visits to the isle of Vancouver and its capital Victoria and the formal farewell dinner brightened up with choirs and musical bands.

– Workshop on Environmental Education for Engineers. The workshop was chaired by Prof. Conrado Bauer and Dr. Amitabha Bhattacharyya and discussed papers presented by experts from Argentina, Bulgaria, Brazil, China, India, New Zealand, Sri Lanka and Venezuela. The participants in this international workshop arrived at conclusions and recommendations addressed to the Universities, the WFEO Member Organizations, the Governments and the International Organizations.

#### **FOURTEENTH MEETING – KATHMANDU – 1988**

On November 12, 1988 at the Hotel Everest Sheraton of Kathmandu, Nepal the 14th Meeting of the Committee was held, one day before the Inaugural Session of the First World Congress on Engineering Education and Training which lasted three days, 13-15 November, 1988.

The first session of the Committee was chaired by WFEO President, Academician Alexander Yu Ishlinsky, who expressed words of praise for the work performed by Dr. Bhattacharyya since 1975, the year in which the GA of Tunis elected the Headquarters of the Committee in India. Academician Ishlinsky also pointed out the extraordinary organizational effort performed by the Nepal Engineers Association in the preparation of

the World Congress and the meetings of the WFEO Committee on E&T, congratulating its president Eng. S. N. Rimal and Dr. S. B. Mathe Organizing Secretary of the Congress who were present at the meeting.

– The demise of Dr. D. L. Mordell. Before starting with the Agenda the President of the Committee announced the sad demise on August 8, 1988 of Dr. Donald L. Mordell who rendered learned and dedicated services for the past 12 years as a member of the Committee. The members observed two minutes silence and decided to send a message of condolence to the family of Dr. Mordell.

– Election of a new President. The first item on the Agenda was the proposal of a name, to be nominated for the presidency of the Committee beginning in 1989, at the next WFEO General Assembly of Prague. Dr. Bhattacharyya informed the members present that after studying the background of the four candidates submitted at the Vancouver meeting and their record related to the activities of the CET, he suggested that the Committee appoint as future President of the Committee Prof. Miguel Angel Yadarola from Argentina. The proposal was unanimously accepted with applause.

– New WFEO Secretariat. The President informed that the General Assembly held in Vancouver decided to shift the WFEO Secretariat from Paris to London, and appointed Eng John C. McKenzie as new Secretary General. According to the President the new Secretary is a person linked for many years to WFEO, and very familiar with the importance of the activity of the Technical Committee on Education and Training.

– Report on ongoing projects: The following papers were presented at the meeting:

i) Criteria for Selection of Academic Teachers for Higher Schools of Technology by Prof. Janus Tymowsky.

ii) Criteria for Evaluating the Quality of Education in Technical Faculties by Prof. Miguel A. Yadarola.

iii) Status of Education and Training of Skilled Technicians in the field of Labour Safety by Prof. Lazlo Felfoldi.

iv) Technology and Education for Rural Housing by Dr. Anwar Hossain.

– Meetings sponsored by the Committee. The President comments that he has participated in the following meetings that were sponsored by the Committee in the name of WFEO.

i) Second International Conference on Progressive Methods, Forms and Technical Means in the Engineering Studies – Bratislava, CR – October 21-23, 1987.

ii) Seminar on Non-Formal Methodologies in Engineering Education and Training – Organized by the Nepal Engineers' Association (NEA) with the active support of the Committee as a prelude to the First World Congress – Kathmandu, May 20-21, 1988.

iii) Seminar on Education and Rural Habitat. Will take place on December 23, 1988 organized by the Institution of Engineers, India.

### **FIRST WFEO WORLD CONGRESS ON ENGINEERING EDUCATION AND TRAINING.**

Held between 13-15 November, 1988, it was organized by NEA. The Main Theme was: Non-formal Methodologies in Engineering Education and Training. The sub-themes (Divisions) selected to better focus the Central theme were:

1. Professional Programmes
2. Open Universities
3. Methodologies
4. Development of Engineering Education and Training.

The Congress was sponsored by UNESCO, FEISCA and received important support from engineering and construction firms, banks and computer distributors. So far 769 participants were registered from 34 countries that have submitted 42 papers to which

the following should be added: 8 Special lectures and 8 Keynote Speakers.

The Inaugural Session and the presentation of the 16 Conferences was made at the Hall of the Royal Nepal Academy of Science and Technology. Also in this place of hierarchy a cultural performance was programmed with the presentation of music, dancing and typical songs of Nepal. At the Inaugural Session of the Congress the speakers were: the President of the WFEO CET Dr. Bhattacharyya, the Prime Minister of Nepal, Marich. Singh Shrestha and the President of the Organizing Committee Dr. S. B. Mathe. On this opportunity the President of the WFEO CET received the Gold Medal of FEISCA.

The Closing Ceremony was honoured by the speeches of the President of WFEO, Academician Alexander Y. Ishlinsky and the Presidents of FEISCA and NEA, Dr. Satish Chandra and Eng. S. M. Rimal. Closing this ceremony in the name of His Royal Majesty the King of Nepal, the Minister of Water Resources Mr. Hari Bahadur Basnet addressed a farewell speech.

– The next World Congress on EE&T. The members exchanged opinions on possible Continents. The first has been in Asia and there is coincidence in seeking a Host Organization in Latin America.

### **FIFTEENTH MEETING – PRAGUE – 1989**

Four years before, the City of Prague was the scenario for the meetings of the WFEO CET. The City, always generous, is now, on September 14, 1989 receiving not only the Committee meeting but all the meetings of WFEO: 12th General Assembly, Executive Committee and the WFEO Technical Committees. Prof. Anton Blazej member of the host organization, the Czechoslovak Scientific and Technical Society CSVTS, and also member of the Committee on E&T expressed that it was an honour and a pleasure for the

engineers of Czechoslovakia to receive in this cultural centre of Europe such important meetings and the engineers involved in them.

President Dr. Bhattacharyya thanked the welcoming words of Prof. Blazej also thanked the presence of the following members of the Committee and invited guests: Prof. M. A. Yadarola (Argentina), Dr. Anwar Hossain (Bangladesh), Prof. Lazlo Felfoldi (Hungary), Prof. Lu Quian (China), Prof. T. Bartlett (New Zealand). Also present: Mr. Sha Zong (China), Mr. William Rourke (Australia), Mr. A. Kareem Salah (Egypt) and Dr. William Sangster (U.S.A.). The Secretary of the Committee Mr. K. N. Majumdar (India) registered notes for the minutes.

- New President of the Committee: Dr. Bhattacharyya introduces Prof. Miguel Angel Yadarola who was appointed President of the WFEO CET as from this meeting in Prague. He briefly summarized his CV pointing out his work as Professor of the Physics Department in the University of Córdoba for the last 34 years, as consulting engineer and what is more important his dedication to International Organizations through their Education Committees: member of the WFEO CET since 1977, twelve years, and member since 1968 and President since 1970 until this year of the UPADI Education Committee. He showed confidence that he was leaving the Committee in good hands. He invites Prof. Yadarola to sit at the head of the table of the meeting to assume the presidency. Prof. Yadarola thanks the presentation made by his antecessor and promised to dedicate his best efforts to making the Committee follow the line of action performed by Dr. Bhattacharyya.

- Terminal Report of the Committee. Dr. Bhattacharyya gave each of the participants in the meeting two documents, well printed, with coloured covers:

- i) DECADE DIGEST, with the inventory of activities, technical meetings, congresses, seminars held during his 15 years as President
- ii) QUEST FOR EXCELLENCE were

many papers presented by the members of the Committee and guest writers were published.

He also gave the new President a bound volume containing the 52 Issues of the Newsletter.

- The Continuity of the Newsletter. Dr. Bhattacharyya stated that UNESCO provided funds for the publication and diffusion of the Newsletter, US\$ 2.000/year. 1.000/1.500 copies were printed according to the interest of the subjects included. He hoped that the annually support provided can be claimed to continue with the publication and suggests interviewing Chief Olu Ibukun of UNESCO. Prof. Felfoldi offered his contacts with an Editorial Agency of the Netherlands. Prof. Sangster suggests that the distribution be made free of charge using diplomatic channels and free air transportation. Prof. Blazej offered to prepare a proposal.

- Second World Congress on EE&T. In Kathmandu it was agreed to look for a Host Organization member of WFEO in Latin America to organize this 2nd World Congress. Prof. Yadarola has contacted FEBRAE (Brazil) and UNAICC (Cuba) but did not have answers. He hopes that at the WFEO General Assembly in which both Dr. Bhattacharyya and himself will participate as members of the ExCo, a new Site could be agreed upon which would be for 1991. The theme of the 2nd Congress will be: „Formation and Training of Engineering Professors for the XXIst Century Challenges”.

- Reorganization of the Committee. Prof. Yadarola informed that in accordance with Dr. Bhattacharyya and the WFEO ExCo, other National Members should be invited to nominate members for the Committee following the Internal Rules of Procedure and that he was going to invite all WFEO National Members to nominate an eminent educator as member and in the case of the present members that have cooperated actively with Dr. Bhattacharyya, he would ask for their re-nomination.

– Higher Technicians in the Field of Engineering. Prof. Blazej proposed this theme suggesting that the activity of the WFEO CET should also cover the Higher Technicians. Dr. W. Sangster: in USA they have a different initial formation but ABET encloses engineering and technology. Prof. Lu Quian: in China, joint meetings generally involve engineers and technicians. Eng Kareem Salah: the Egyptian Engineers Syndicate is involved in the training of Higher Technicians. Dr. Bhattacharyya informed that funds can be obtained from UNESCO to open a debate and proposes that the Committee organizes the „First Regional Seminar on New Roles for Higher Technicians in the Field of Engineering” and seek a National Member interested in starting a series of Regional Seminars.

– Increase of Contacts with Societies and Institutions. Eng. W. Rourke suggested that the Committee should start an active campaign of diffusion of its objectives among several Engineering Societies and Institutions all over the world. That cooperation agreements be reached, and also the exchange of publications, participation in meetings, etc. Prof. Yadarola informed that IACEE, International Association for Continuing Engineering Education was created in May 1989 in Beijing and that he was elected Member of the Board representing UPADI until 1992. The Secretariat will be in Finland. He hoped to work together with this Association.

– Quality of Engineering Education. All members coincided in that it is a very important matter. The Committee discussed in its meeting at Kathmandu two papers that broach this theme prepared by Prof Janus Tymowski and Prof. M. A. Yadarola. Everyone coincided in that the theme should be on the Agenda of future meetings of the Committee.

– Next Meeting in Cairo. Eng. Kareem Salah in the name of ESE and of Eng. Ahmed Khaddad, Vice President of WFEO invited the members to hold the next meeting in Cairo in September 1990. This was accepted.

– Dr. Bhattacharyya Honorary President. The Committee unanimously approved the proposal of the new President to nominate Dr. Amithabha Bhattacharyya Honorary President „in appreciation for his brilliant performance in the direction of the Committee during 15 years”.

## SIXTEENTH MEETING – CAIRO 1990

The purpose expressed by the new President at the meeting in Prague, of renewing the Committee according to the Internal Rules of Procedure with representatives from countries that have not participated so far, was complied with, during the past year. Several WFEO National Members ratified their representatives: Hungary: Prof. Lazlo Felfoldi, Bangladesh Dr. Anwar Hossain, United States Dr. William Sangster. Other National Members appointed new members: Australia, Brazil, China, Commonwealth, Egypt, France, Germany (FR), Japan, Poland, United Kingdom. Corresponding members were nominated by Iraq, Malaysia, Mexico, New Zealand and Zimbabwe. India continues to be represented by Dr. Bhattacharyya as Honorary President.

All members, old and new were invited to join the first meeting of the renewed Committee. But an unexpected event frustrated the trip of several members: the invasion of Kuwait and the imminent war that was foreseeable in the Gulf, on a date that could include the dates planned for the Cairo meeting. Several European and American countries discouraged their national members to go to countries that could be involved in the conflict.

The annual meeting of the CET was held on September 16, 1990 at the Sheraton Hotel Cairo. On September 17 a Round Table was organized by the host Organization at the Headquarters of the Egyptian Engineers Syndicate on „Engineering Education and Development” with the participation of all the members of the Committee attending the Cairo meeting, and outstanding personalities

from different sectors: university, government, syndicate and associations.

On September 16, when the Committee meeting started, Prof. Yadarola pointed out the presence of the following members: Dr. Saad El-Raghy (Egypt), Prof. Ruy C. de Camargo Vieira (Brazil), Dr. Myron Chin (Commonwealth), Prof. Vollrath Hopp (Germany FR), Dr. Lazlo Felfoldi (Hungary). Following this the President gave thanks to the hospitality of the Egyptian engineers and especially, the presence at the meeting of Prof. Ahmed Khaddad (Vice President of WFEO), Eng. Saad M. Elzayat (Secretary General Egyptian Engineers Syndicate) and also members of the Board of ESE: Dr. A. Kareem Salah and Dr. Mohamed Bishr from Cairo University.

Also present at the meeting invited specially was Prof. Vincenzo Romano, representing the Experts and Training Committee of UATI/UITA – Union of International Technical Associations, a world-wide organization like WFEO with which the present authorities, President Acad. A. Y. Ishlinsky from WFEO and President Eng. Pierre Pecoux UATI/UITA, have reached an agreement of cooperation.

After the welcoming words by Prof. Khaddad Vice President of WFEO and Eng. Elzayat of ESE, the President thanked the host organization for the attitude of taking upon itself all the expenses incurred by the stay of the visitors and their participation in cultural and tourist events.

During the meeting the following themes included in the Agenda were considered:

- Status of Education of Engineers and Higher Technicians and their Associations. Papers on this theme were submitted by: Dr. Vollrath Hopp, Dr. Myron Chin, Prof. Kaneichiro Imai, Dr. Yee-Cheong Lee. Oral presentations were made by Prof. R. de Camargo Vieira and Dr. Saad El-Raghy.

- Second World Congress on EE&T. The efforts of the President to have this second edition of the WFEO World Congress in

Latin America were successful. The WFEO National Member for Cuba, UNAICC decided to organize this meeting in Havana, Cuba nominating an Organizing Committee chaired by Prof. Hugo Wainshtock Rivas renowned for his activity in the area of UPADI. The dates will be: 10 to 14 September, 1991. The theme suggested by the Committee was gladly accepted by the host Organization.

All the members of the Committee accepted to act as Correspondents of the Organizing Committee at the Educational Institutions of their countries and their region: FEANI, SEFI, CEC, FAE, UPADI, FEISEAP.

- Third World Congress on EE&T. The President considered it important to make commitments for the 3rd Congress that should be held in 1994, and informs that during the WFEO Executive Committee meeting held in Washington last August 1990, Eng. W. Rourke suggested Australia as a possible place. A letter from the Institution of Engineers Australia received on the first days of September 1990 expressed that they needed to further study this commitment. In view of the possible uncertainty, Dr. Saad El-Raghy formally proposed in the name of ESE that the Third World Congress be held in the African Continent and offered Cairo, Egypt as the see to hold it.

- New Roles for Higher Technicians in the Field of Engineering. The Committee discussed and approved a detailed agenda of the different aspects involved in this theme that should be part of a First Regional Seminar that could take place in Cairo, together with this meeting according to the interest shown by the representatives of ESE. Eng. Saad Elzayat stated that this was the intention of ESE but that there was little time to organize a Seminar that should cover the countries of Africa, apart from the international politics situation. The President comments that he will propose to hold this Seminar to other WFEO National Members.

- Combating Technological Illiteracy through Quality Post-Graduate Courses in

Engineering. This UNESCO project was explained personally to the President of the Committee by Dr. Adnan Badran Assistant Director General and Dr. Boris Berkovsky Director of Technical Research and Higher Education at a meeting in Paris, requesting the cooperation of the WFEO CET. Also these UNESCO officials suggested that the Committee concentrate its activities on a few programs that can be included in the Bi-annual Budget approved by the General Conference.

Possible Post-graduate courses were discussed that could be proposed to UNESCO and their scope was analyzed:

- i) Environmental Engineering and Economic Development
- ii) Chemical Engineering – Engineering Management
- iii) Transportation Engineering
- iv) Safety Engineering
- v) Food Engineering.

A theme was considered crucial: the lack of entrepreneurs among engineers and the need to reinforce their formation through a relationship Industry-University stronger and specific to generate vocations, abilities and competences.

– Joint Programs with UATI/UITA Experts and Training Committee. Prof. Vincenzo Romano explained the working areas of the UITA Committee that he presided and the possible themes for joint action.

– Status of Engineers and Educational Institutions in Deprived Areas. The theme was proposed to our Committee by the WFEO ExCo in Washington when a report „Visit to Occupied Territories” of Palestine was presented by Eng. Carlos López Rivera (Mexico), Eng. A. Seppanen (Finland) and Dr. Amitabha Bhattacharyya (India) who visited Palestine and Israel by invitation of their governments. The Committee approved a „Declaration” that not only involved Palestine but also other deprived areas where there are minorities that do not have access to an education in engineering of a good level.

– New Mechanisms for International Cooperation. Prof. Yadarola distributes among those present a paper on this theme that he will submit as President of the Committee in Mexico, Acapulco on December 3/6, 1990 as Invited Speaker in the International Colloquium: „Science and Technology for the Future of Latin America”, organized by UNESCO and the Consejo Consultivo de Ciencias de Mexico.

– Publication of a Newsletter. When the Committee had its Headquarters in India, 53 issues of the Newsletter were published, the last one was distributed after the meeting in Prague. UNESCO financed this with US\$ 2000/year. Prof. Yadarola interviewed on August 30, 1990 in Paris Dr. Adnan Badran and Dr. Boris Berkovski from UNESCO and informed them of the new Headquarters of the Committee and talked about the possibility of continuing the economic support of a publication. He was informed that It was a new policy of UNESCO not to sponsor any Newsletter in the future and concentrate this type of support in the edition of specialized publications.

The members of the Committee participated in a Farewell Dinner with music and traditional ballets. They then received delicate gifts from the hosts. The show of light and sound at the Pyramids was thrilling and provided a beautiful setting for the last day in this millenary country.

## **SECOND WFEO INTER-COMMITTEE MEETING – MADRID 1990.**

Summoned by the General Secretary of WFEO, Eng. John C. McKenzie, this meeting took place in Madrid, at the Headquarters of the Instituto de Ingeniería de España, on November 26-27, 1990. The Coordinator of this meeting Eng. Marwan Abdelhamid (Palestine) member of the WFEO ExCo, directed the meeting. Present were: Eng. Michael Leonard (U.K.), WFEO Vice President, Dr. George Djolov (Environment), Eng. Jean Michel (Information and Communi-

cation), Dr. A. Nolasco (Food Engineering), Dr. Ruhi Sharif (Technology), Eng. Fayek Faragalla (Energy) and Prof. Miguel A. Yadarola (Education).

The following matters were discussed:

- i) WFEO-UATI/UITA cooperation in the respective technical areas.
- ii) Participation in the activities programmed for the International Decade for Natural Disasters Reduction (IDNDR).
- iii) Evaluation of the Programmes in force of each WFEO Committee
- iv) Cooperation with the WFEO Committee on Information and Communication in a joint Seminar on the theme: „From Information to Formation – New Approaches for Education and Training of Engineers”.

### SEVENTEENTH MEETING – HAVANA – 1991

At the Headquarters of UNAICC – The National Union of Architects and Engineers of Construction of Cuba started the 17th meeting of the Committee on September 9, 1991 with the presence of the President of the host Organization Architect Pedro Galiano Blanes and also representing the Organizing Committee of the Third World Congress the President, Eng. Hugo Wainshtock Rivas and the Secretary Eng. Arturo Bada Gonzalez.

Architect Galiano expressed the honour and satisfaction of the engineers and architects of Cuba, in being able to assume the challenge and responsibility of working to perform this second world encounter of educators in engineering and also to host the annual meeting of the WFEO CET where always arise from their deliberations adequate recommendations for all the institutions involved in the formation of engineers.

The President Prof Yadarola thanked them for their hospitality and friendship they were receiving and introduced the members of the Committee and special guests that are participating: Mme. Nicole du Vignaux (France),

Mme Bozena Josefowicz (Poland), Prof. KaneIchiro Imai (Japan), Dr. Saad El-Raghy (Egypt) and Prof. Lazlo Felfoldi (Hungary). Alternate members Dr. Russel C. Jones and Dr. David Reyes Guerra (USA), and Prof. Mohamed Elizzi (Iraq). Representing UATI/UITA Dr. Vincenzo Romano. Especially invited: Dr. Leslie Benmark (ABET-USA)). Representing UPADI Eng. Carlos Santana, President of the Education Committee. Also present in the first part of the meeting, Dr. Rafael Portaencasa, Rector of the Polytechnic University of Madrid who was invited as Key Note Speaker of the 2nd World Congress. The President asked the members and guests to make a brief self-presentation of their activities after which the following items of the Agenda were discussed:

– Third World Congress on EE&T. At the Cairo meeting in 1990, the proposal of the Egyptian Syndicate of Engineers was accepted to choose Africa and as a country Egypt to hold the next World Congress. Dr. Saad El-Raghy brought with himself a letter from ESE confirming the proposal and the decision to organize a first level meeting in Cairo in November 1994. The Theme shall be: „Quality of Engineering Education and the Global Perspective”. Dr. El-Raghy was in charge of the organization.

Research-Industry-Education Cooperation. A paper on this subject has been brought by Mme. Dr. Du Vignaux at the request of the President. The President explained that once discussed and approved by the Committee it shall be submitted to UNESCO to serve as Terms of Reference for a Workshop that shall be jointly organized by UNESCO, WFEO and UATI/UITA. Dr. Adnan Badran Assistant Director General of UNESCO suggested this collaboration from the Committee to Prof. Yadarola when he visited the Paris Headquarters on May 12, 1991. According to Dr. Badran's expressions, WFEO and their National Member Organizations can help to strengthen the links between Education and Industry, but including a new area, not always dependent on them: „Research”. Each member committed himself to analyze



the possibility of organizing a Workshop, be it of a national or regional nature.

– 1991 ASEE Annual Conference „The Challenges of a Changing World”. Especially invited by the President of ASEE Prof. Curtis J. Tompkins the President of the Committee attended this meeting held at the Hyatt Regency Hotel in New Orleans on June 17-19, 1991. Advantage was taken of the occasion by Prof. Yadarola to establish links of cooperation between the Committee and ASEE.

– Second International Symposium for Engineering Deans and Industry Leaders. Dr. Russel C. Jones who was in charge of the organization of the Symposium was invited by the President to summarize the outcomes. The Symposium was sponsored by UNESCO, WFEO, UATI/UITA, the Ohio State University (USA) and was held at the UNESCO Headquarters in Paris on July 16 to 20, 1991. Prof. Yadarola chaired one of the seven Working Groups „Database on Engineering Education” on the basis of a paper he presented that served as a guide for the discussions. The same responsibilities were held by those that chaired the other six Working Groups. The Symposium had a Special Session, chaired by Prof. Donald Glower from the Ohio State University in which progress was made in the creation of a „Worldwide Organization of Engineering Deans”.

The Conclusions and Plans of Action involved the following matters:

- i) Sister University Programs,
- ii) Industry-University interaction,
- iii) International Database on Engineering Education,
- iv) Clearing house on Equipment and Courseware,
- v) Completion of Education of Faculty (to Doctorate) in Developing Countries,
- vi) Educational Standards Equivalency and Accreditation,
- vii) Use of Satellite Technology.

More than 200 persons participated counting Deans, industry leaders and from Engi-

neering Societies representing 50 countries.

– Joint Actions with UATI/UITA and UPADI. Both organizations were present in Havana: Dr. Vincenzo Romano, President of UATI Committee on Experts and Training and Eng. Carlos Santana, Chairman of the Education Committee.

With UATI/UITA the most important theme that involved WFEO was the mobility of all the Engineering Organizations to participate in the International Decade for Natural Disasters Reduction (IDNDR). A World Congress to be held in Arusha, Tanzania on 23-25 September, 1991 and a Workshop in Paris on 16-18 October „Contribution of the Engineers to the Reduction of Natural Disasters”. Formation of engineers for the Management of NDR was briefly discussed.

With UPADI, cooperation with the Ibero American Structure for the Support of Engineering Education (EIBAEI) that was created in 1986 at the Headquarters of UNESCO Latin America, in Montevideo when Prof. Yadarola presided the UPADI Education Committee. The Structure's main objective is to homogenize engineering education curricula in order to achieve similar levels of quality to the two European countries members of the Structure – Spain and Portugal and through them the entire European Union.

– News regarding WFEO Organization. The WFEO ExCo decided to transfer the Secretariat to Mexico with Eng. Carlos Lopez Rivera, Past President of UPADI and Past Vice President of WFEO as Secretary General. The sudden demise of Eng. Lopez Rivera meant keeping the Secretariat in London with Eng. John C. McKenzie in this function. At the General Assembly in Arusha, Tanzania, September 26-27, 1991 Dr. William Carroll was confirmed as President of WFEO and at the same Assembly, Eng. Conrado Bauer was nominated President Elect. Eng. Bauer was also appointed Chairman of the Engineers Affairs Committee, to act as Coordinator of all

the Technical Committees. Dr. Bhattacharyya was elected Vice President of WFEO.

– Important Anniversary in Mexico. To celebrate the 200 years of Engineering Education in Mexico, a Seminar was programmed in the old headquarters of the School of Mines, nowadays the „Palacio de Minería“, between 15-17 January, 1992. Prof. Yadarola was invited to speak on „The Social and Humanistic Role of Engineering”.

## **SECOND WFEO WORLD CONGRESS ON ENGINEERING EDUCATION AND TRAINING**

It was held in Havana after the meeting of the CET between 10-13 September, 1991. The place of the meeting was the International Conferences Center, a modern and functional building. The main theme was: „Training of Engineering Professors to meet the Challenges of the 21st. Century”. It was sponsored by UNESCO, UATI, UPADI, SEFI and ISEE. The Organizing Committee was chaired by Prof. Hugo Wainshtock Rivas under the responsibility of UNAICC. At the Opening Session, Prof. Yadarola spoke in the name of the President of WFEO Academician Alexander Yu Ishlinski. Also the Minister of Higher Education of Cuba Dr. Fernando Vecino Alegret. The Opening Session ended with a Conference by Dr. Rafael Portaencasa Baeza, Rector of the Polytechnic University of Madrid.

190 participants from 21 countries analyzed 65 papers (24 from abroad) working in three Committees and three Round Tables where each of them produced the Conclusions and Recommendations that enriched the results of this Congress. Themes:

- i) Identification, formation and development of faculty members,
- ii) Educational Technology in the work of a Professor,
- iii) Role of the Engineering Professor in the link with the Productive Sector,
- iv) Continuing Education,

v) Mechanisms for the retention of educators,

vi) Institutional and Programme Accreditation.

At the Closing Session there was a speaker for each Continent: Eng. Carlos Santana (America), Prof. Kaneichiro Imai (Asia), Prof. Saad El-Raghy (Africa) and Mme. Nicole du Vignaux (Europe).

– Open letter to UNESCO. An Open Letter to Dr. Federico Mayor, Director General of UNESCO was signed by all the participants requesting stronger support and initiatives tending to improve the formation of engineers and engineering professors all over the world, especially in less developed countries.

The hosts offered the participants a Cuban Night Show in the famous „Tropicana” and a typical dinner in the rooms of the old Parliament. Tourist visits were also programmed to the old Havana that is Patrimony of Humanity and also several technical visits.

## **EIGHTEENTH MEETING – HELSINKI – 1992**

The host institution of several WFEO meetings was the Helsinki University of Technology in Espoo, Helsinki, Finland starting on the last days of May 1992 with the Executive Committee. The ExCo analyzed the progress of the WFEO Technical Committees, among them the CET, whose report was produced by the President.

The 18th Annual Meeting of the CET started on Monday, June 1st with the presence of the Secretary General of IACEE Prof. Markku Markkula who spoke the welcome words in the name of the Association and the University where simultaneously the Fifth World Conference on Continuing Engineering Education was being held.

In the meeting of the Committee the following Full Members participated: President Prof. Miguel A. Yadarola (Argentina), Mme.

Nicole du Vignaux (France), Mme Dr. Bozenna Jósefowicz (Poland), Prof. Dr. Saad El-Raghy (Egypt), Prof. Dr. Vollrath Hopp (Germany), Prof. Dr. Lazlo Felfoldi (Hungary), Prof. Dr. Kaneichiro-Imai (Japan), Prof. Dr. Myron Chin (West Indies C.E.C.), Prof. Dr. Jack C. Levy (U.K.) and Prof. Dr. William M. Sangster (USA). Alternate Members attending were: Prof. Peter Hector (U.K.), Dr. David Reyes-Guerra (USA), Dr. Russel Jones (USA) and Corresponding Members: Prof. Carlos Santana Morales (Mexico – President of UPADI Committee on Engineering Education) and Dr. Frank L. Huband (USA – Executive Director ASEE).

– ABET Annual Conference on EE. The theme of the Conference was „Quality in Engineering Education”. Dr. Reyes-Guerra was in charge of offering a summary of the conclusions that were considered a valuable contribution towards the preparation of the Theme for the 3rd World Congress on E&T.

– Quality Post Graduate Courses. UNESCO has organized in Europe (Yugoslavia) and in Africa courses on „Energy Engineering” and the possible help of the Committee was considered by the officers of the Organization when they met with the President, for its implementation in Latin America. The role of the Committee should consist in identifying the Universities of the Region, in Argentina and Brazil at the first stage and reach agreements with the Regional Office of UNESCO for Latin America and from there, simply follow up the programme. These Courses implied the development of interactive packages on video and easily accessible software for teaching-learning attached to each lecture. The first course to be promoted may be a pilot course on „Energy, Environmental Engineering”. According to Prof. Yadarola, the purpose of these post-graduate courses was to provide the Universities with a new tool that they were not in a position to structure themselves and at the same time that can be useful to Industry.

– Third World Congress on EE&T. Dr. Saad El-Raghy as Chairman of the Organizing Committee reports a detailed agenda that

is analyzed by the members. The place will be the International Conference Centre or better one of the big Hotels of Cairo like the Sheraton or Marriott so as to facilitate the concentration of lodging and meetings. The date, November 14-18, 1994. Prof. Yadarola believes it would be necessary to review the Programme in detail and the organization with plenty of anticipation to the Congress.

– Second International Symposium for Engineering Deans and Industry Leaders. This meeting was sponsored by WFEO, UATI and UNESCO and was held at the Headquarters of UNESCO Paris in July 1999. Dr. Russel C. Jones who was organizer and Rapporteur of the Symposium presented a detailed summary of the objectives and the Recommendations agreed. Eight groups of themes were discussed by 200 participants from 50 countries. The primary objective was the design of action oriented programs aimed at enhancing engineering education, technically oriented industry and economic development. Dr. Jones suggested the possibility that the Committee analyze and assume the implementation of actions such as:

- i) Database on Engineering Education
- ii) Educational Standards/Equivalences
- iii) Worldwide Organization of Engineering Deans.

Conditions were going to be discussed by Dr. Jones with the UNESCO Assistant Director General Dr. Adnan Badran.

– World Seminar on Education in Environmental Engineering. Sponsored by WFEO and UNESCO this meeting was to be held in Paris in September 1993. The participation of some 20 invited Engineering Deans is foreseen, selected in developing countries where teaching of environmental engineering has a good level. The President of the WFEO Committee on Engineering and Environment Prof. David Thom and the WFEO President Elect Eng. Conrado Bauer suggested that the Seminar be co-organized with the Committee on E&T and UNEP – United Nations Environmental Program.

– Distance Learning Courses in Engineering Education. Proposed by The Institution of Engineers, Australia, the theme was discussed and a report should be brought by the members to the next annual meeting:

- Dr. Kaneichiro Imai – Japan National Broadcasting Co.
- Dr. Jack C. Levy – Open University of UK
- Dr. David Reyes-Guerra – National Technological University
- Dr. Myron Chin – IACEE projects on Distance Continuing Engineering Education Courses.

– Newsletter of the Committee. Dated 1991, Issue N° 54 of this bulletin was printed at the Headquarters of the Committee, in Cordoba, Argentina containing information on the last meetings, congresses, symposiums sponsored by WFEO. A special Section was dedicated to the 2nd WFEO World Congress in Havana. The new publication is adapted to the A4 format that other WFEO publications have such as that of the Environment Committee, also SEFI News, AEESEAP Links, etc. Prof. Yadarola delivered a set of bulletins for each member to distribute in their countries.

The continuity of the Newsletter was depending partly on the support that can be obtained from UNESCO, but also on the interest shown by those who receive it free of charge.

Most of the Committee Members decided to stay in Helsinki and visit the city and its surroundings during Tuesday, June 2. On Wednesday June 3 the Opening Ceremony of the 5th World Conference on CEE was held with the participation of the Minister of Education of Finland, Mrs. Riitta Uosukainen, the Director General of UNESCO Dr. Federico Mayor, the Chairman of the Conference Prof. Bertel Hakulin, the President of IACEE Prof. John Klus and the President of SEFI Prof. Evan Petty. The final Plenary Session took place on Friday afternoon followed by a pleasant Closing Dinner.

A Professional Tour to St. Petersburg was enjoyed by many participants to fraternize with Russian engineers. The night shipping through the Baltic and the visits to the Hermitage, the Art Museum in the Winter Palace and the Czar's Summer Palace were enjoyed by many participants. The epilogue of the tour was a typical dinner with Russian dancing.

## **NINETEENTH MEETING – PARIS 1993**

The 19th Meeting of the CET was held on 21-22 June 1993 at the UNESCO Headquarters and continued on June 26 at the CNISF – Conseil Nationale des Ingenieurs et des Scientifiques de France – Headquarters, both in a central part of Paris.

Dr. Boris Berkovski welcomed the members in the name of UNESCO and expressed his preoccupation because the prestige of engineering is deteriorating all over the world and insisted that the Committee should plan actions to revalue this prestige as is the case of the International Congress of Engineering Deans and Industry Leaders to be held in Paris between 23 and 25 June, 1993 sponsored by UNESCO, WFEO and UATI.

– Homage to Dr. Amitabha Battacharyya. Before starting with the Agenda, the President requests all the members to stand and keep silent for two minutes as a homage to Prof. Dr. Amitabha Battacharyya who died in Brussels at the end of June 1992. Dr. Battacharyya was at the time Vice President of WFEO and Honorary President of the WFEO CET. He had also been President of the Institution of Engineers, India and a renowned engineering professor in his country.

– Members attending the meeting. The President Prof. M. A. Yadarola thanks everyone for the homage to his predecessor and the opening words of Dr. Berkovski and points out the presence of the following members: Mme. Dr. Nicole du Vignaux (France), Prof. Dr. Saad El-Raghy (Egypt), Prof. Dr. Kaneichiro Imai (Japan), Prof. Dr. Jack C. Levy

(UK), Prof. Dr. William Sangster (USA) and Prof. Dr. Anwar Hussain (Bangladesh). Alternate Member Dr. Russel C. Jones (USA).

Once the meeting started WFEO President Dr. William J. Carroll entered and expressed his satisfaction at finding many personalities from the engineering education field, meeting under the WFEO emblem and expressed his acknowledgement for the work of the Committee. He considered the Programme being carried out very valuable especially that of „Educational Standards and Equivalences and the possibility of establishing quality patterns common to all countries for Accreditation of Engineering Programmes, the only way we can talk of an Internationalization of Engineering Education”.

– UNESCO Steering Committee on Human Resources Development for Technical Industry Stimulation. It was created with the purpose of giving continuity to the Recommendations of the Conferences and Congresses of Engineering Deans. Prof. Miguel A. Yadarola and Dr. Russel C. Jones were invited to join it. Dr. Jones commented that a joint meeting of both Committees, CET and Steering is planned for the afternoon of that day, to find ways to work together.

– Third World Congress on EE&T – Cairo. An extensive report was presented by Prof. Saad El-Raghy: a National Committee was formed with 20 Deans, industry leaders and a representative of the Supreme Council of Universities.

The members analyzed the theme for the Congress with its sub-themes, the organization and the way of preparing a good „call” for papers. They agreed that: A Basic Document should be prepared by the Organizing Committee, with the participation of experts, so as to orient the presentation of papers to focus the discussion on the subject included in the call. Prof. Yadarola suggested including in the information to the participants the existing documents on Seminars and Congresses, that they can consult before, on the

Theme „Quality in Engineering Education” as the SEFI Seminar held in 1992 in Dublin. He pointed out: „We have to avoid the discussion on subjects that have been vastly analyzed”. Dr. Hopp insists on involving important industry leaders. Dr. Jones proposed a Sub-theme: „Incorporation of engineers to international practice”.

– Third International Congress of Engineering Deans and Industry Leaders. This meeting was being held simultaneously at the UNESCO Headquarters, in Paris, on 23-25 June, 1993. Dr. Russel Jones summarized the themes that were going to be discussed by the invited panelists.

- i) Networking of universities, research institutions and industry
- ii) Industry cooperation for educational training
- iii) Preparation of engineers for effective contribution in the needs of national economy
- iv) International cooperation: the new dimension
- v) Quality engineering training in developing countries
- vi) Technology transfer: successes, failures and prospects.

– Database on Engineering Education. The Task Force Jones-Yadarola had prepared a Project that will be submitted to the UNESCO Steering Committee. The purpose is to implement pilot programmes in Latin America and seek external financing from World Bank. Dr. El-Raghy remarks that FAE is willing to finance a Database for Arabic Countries. Dr. K. Imai offers an existing database in Japan and the cooperation of the Association for International Education of Japan.

– Educational Standards and Equivalences. Members reported on the existence of national standards that institutions of their country establish and control. Mme. Du Vignaux: in France the standards are determined by the CTI, an Engineering Qualification Commission created in 1932 and formed by 32 members, 16 representing the Ministry of Educa-

tion, 8 from employers and 8 from professional associations. Dr. W. Sangster: in USA there are 57 States that grant the license to practice but only one in each state. The system created in 1932 delegates in ABET the annual updating of the standards with the input of the member Specialized Societies. ABET has agreements with other English speaking countries through the Washington Accord. Dr. El-Raghy: a Law of 1992 established in Egypt that all engineering degrees fall under the Supreme Council of Universities for accreditation. Prof. J. Levy: in UK the registration of engineers is the responsibility of the Engineering Council, there are three Sections for the register: Chartered (ChEng), Incorporated (I.Eng.) and Engineering Technicians (Eng.Tech.). The Council specifies the levels of formation, training and experience required for each level. Dr. K. Imai: in Japan, a University must achieve its own quality standards. The High Qualification Council was recently created, in 1992, with an Accreditation Commission formed by members of professional societies and the industry.

- Distance Learning in Engineering. Three written reports were submitted:

i) Distance Learning (EAD) in Conservatoire des Arts et Metiers - France (CNAM) Dr. Nicole du Vignaux

ii) Distance Education in Japan, Dr. Kaneichiro Imai

iii) The Open University U.K., Prof. Jack Levy.

It was decided that these reports and others submitted in time by the members, should be widely diffused by the Presidency.

- Equivalences in Europe: The EurIng. Mme. du Vignaux gave a detailed presentation. The EurIng does not imply granting equivalences of studies, since in each country the requirements for the degree are different. EurIng is a degree granted by the National Societies of Engineering members of FEANI that certify the capability of a person to practice engineering in European countries. It is

not valid in relation to public or governmental institutions. To date (1993) 16.000 EurIng degrees have been granted.

- Curriculum on Maintenance Engineering. The theme was proposed by Dr. Anwar Hossain, considering its importance for developing countries where awareness has not been created on the need of maintaining technical equipment and there is no trained personnel because universities do not include this subject in their Plans of Study. Prof. Yadarola comments that UPADI has a Maintenance Committee with headquarters in Venezuela, a country where special attention has been paid to maintenance. He will make the necessary contacts for Dr. Hossain.

- Nomination of the Board. The internal Rules of Procedure suggest that each WFEO Committee should appoint a Board to meet if necessary between the annual meetings. Prof. Yadarola proposed that the Board be formed by: Mme. du Vignaux, Prof. Levy and Prof. El-Raghy. This was accepted. The Board should meet in Paris in January 1994 to review the organization of the 4th World Congress to be held in Cairo.

During their stay in Paris, the members of the Committee were offered a Dinner at the Restaurant of the Eiffel Tower by the President of CNISF, Ing. Gilbert Rutman.

## MEETING OF THE BOARD - PARIS 1994

The Coordinator of International Relations of CNISF Eng. Bernard Lafitte and Mme. Nicole du Vignaux welcomed the members of the Committee in the name of the President, actually Vice President of WFEO Ing. Jean Roret who was present at a certain time of the meeting to greet the participants.

All the members of the Board were present and also Dr. Russel Jones who was participating in the meeting of the UNESCO Steering Committee on the following day, together with Prof. Yadarola. Also, especially invited,

the Secretary General of UATI, Ing. Pierre Pecoux was present during the meeting.

– Third WFEO World Congress on EE&T – Cairo. The theme „Quality of Engineering Education, an International Perspective” was confirmed and also the dates: November 14-18, 1994. Prof. Saad El-Raghy informs: – Official languages will be English and Arabic, abstracts only in English – The Organizing Committee (OC) has distributed 3.000 copies of the call for papers, sent to the principal Universities, Professional Societies, large industrial enterprises, Engineering Education Associations and also bulletins, magazines and specialized newspapers.

– The following aspects were discussed and agreed:

- i) Place: Cairo Sheraton Hotel
- ii) Registration
- iii) Invited Papers
- iv) Different Topics of the main Theme
- v) Organization of each of the sessions, with: Chairman, two co-chairmen and one Rapporteur in charge of a synthesis and the Conclusions and Recommendations to be delivered to a General Rapporteur
- vi) Second call for papers, information to be briefly included: history of the two previous World Congresses of Kathmandu (1988) and Havana (1991)
- vii) Guidelines for the preparation of papers.
- viii) Registration and hotel prices.
- ix) Technical and Cultural visits.
- x) Opening Ceremony with authorities of the Egyptian Government, UNESCO, WFEO, the Council of Egyptian Universities and ESE.
- xi) Social activities.

– Publication of the Journal „IDEAS”. The President brought to this meeting 100 issues of the first number of what in future could be a „Journal” published by the Committee: Prof. Yadarola explained that this publication arose from the commitment assumed by the President at the last meeting in Paris, to widely diffuse papers on Distance

Learning in Engineering presented by three members. All persons attending the Board meeting expressed a favourable point of view praising the idea of the President and the careful presentation of the Journal. It was decided to continue with the publication with papers submitted by the members of the Committee and others selected by the Editor.

– Joint Actions WFEO-UATI. The Agreement signed by the President of WFEO, Dr. William Carroll and the President of UATI, Ing. Michel Saillard established the areas of mutual cooperation, preferably between the WFEO Education and Training Committee and the UATI Committee on Cooperation University-Industry, at present chaired by Prof. C. Giangreco, from Italy. Mme. Nicole du Vignaux is a member of this UATI Committee, representing CNISF, and will act as liaison.

– International Congress of Engineering Deans and Industry Leaders. Dr. R. Jones informs that two places were proposed for the next 1995 Congress: Australia and Paris. The UNESCO Steering Committee with the agreement of all the invited parties decided to hold the 4th International Congress in 1995 at Monash University, Melbourne, Australia and the next Congress in 1996 at the UNESCO headquarters in Paris, celebrating the 50th Anniversary of the Organization. The invitation for the meeting of the E&T Committee in Melbourne in 1995 will be analyzed during the next Annual Meeting in Cairo.

At the end of the Meeting the authorities of CNISF offered a cocktail, served in the Headquarters.

## **TWENTYETH MEETING – CAIRO 1994**

At the Headquarters of the Egyptian Engineers Syndicate (ESE) this 20th meeting was held on November 16 and 18, 1994. The first day, Wednesday 16, the following members were present: Prof. Miguel A. Yadarola, President (Argentina), Mme. Dr. Bozenna José-

fowicz (Poland), Mme. Dr. Ruzena Petrikova, (New Member Czech Republic), Prof. Leizer Lerner (New Member – Brasil), Prof. Saad El-Raghy (Egypt), Dr. Vollrath Hopp (Germany), Prof. Jack Levy (UK), Prof. Kaneichiro Imai (Japan), Prof. William Sangster (USA). Alternate Members: Dr. Russel Jones (USA), Dr. David Reyes-Guerra (USA-El Salvador). Special Guests: Eng. William Rourke (WFEO Vice President – Australia), Prof. Zenon Pudlowski (Australia), Dr. Hassan Al-Sanad (Egypt).

The President of ESE Dr. Salah El Dim Abdel Karim came to the meeting place and greeted everyone inviting them to join a cocktail that ESE was offering the members of several WFEO Committees that accepted to meet in Cairo.

– Fourth WFEO World Congress on EE&T. Eng. William Rourke, speaking on behalf of the Institution of Engineers, Australia presented a formal invitation to hold the Fourth World Congress in Sydney before or after the WFEO General Assembly that was scheduled for November 1997 in Hong Kong. This modality, he expresses, „has been used in this year 1994, because on the week previous to the World Congress in Cairo, the WFEO ExCo met in Amman, Jordan”.

Prof. Jack Levy informed that he received the proposal of the Association of Engineers of Romania AGIR to host, at the Polytechnical University of Bucharest, the Fourth World Congress on 15-30 Jun, 1997. Dr. V. Hopp argues in favour of Bucharest considering that after the fall of the wall the Committee and WFEO should try to build stronger links with the countries of Eastern Europe.

Dr. D. Reyes-Guerra reminds everyone that Australia had already been proposed as headquarters for the 3rd World Congress and that in Havana it was decided to hold it in Egypt.

The President put the matter to vote and Sydney, Australia in November 1997 was chosen, the week before the ExCo meeting in Hong King.

The following Recommendations were expressed by the Organizers of the Sydney Congress:

- i) First Announcement, two years before
- ii) Guidelines for the submittal of papers
- iii) Solve the problem of having parallel meetings with papers of interest submitted simultaneously
- iv) Involve Industry in the financing
- v) Be careful about simultaneous meetings of FEISEAP that could rob participation from our Congress.

– WFEO-UATI Cooperation. Besides the information contained in the Minutes of the Board Meeting in Paris, Prof. Yadarola adds another important information: WFEO and UATI have signed an agreement to jointly establish the International Council for Engineering and Technology ICET, an entity that will thus bring together all technical and engineering organizations under the same umbrella. The new entity will be at the same level as ICSU in front of the United Nations. Joint activities were already discussed at the Board Meeting in Paris to which is now added the possibility of contributing solutions and works for the programme „International Decade on Natural Disasters Reduction” IDNDR that is sponsored by ICET and UNESCO. Several members expressed favourable opinions for the Committee to be involved in „Education for Natural Disasters Reduction”. Other members, Dr. K. Imai, Prof. J. Levy and Dr. V. Hopp opined that the reduction of disasters is a social problem that requires adequate planning. No specific action was approved.

– Report on Engineering Education Systems. This matter was dealt with at the 1993 meeting under the heading „Educational Standards and Equivalences”. National reports were presented by: Dr. K. Imai (Japan), Prof. Mme. B. Josefowicz (Poland), Dr. V. Hopp (Germany), Prof. L. Lerner (Brazil) and Prof. M. A. Yadarola (Argentina). Prof. Jack Levy presents the FEANI model to describe educational systems in Europe and the Committee decides to adopt this model to propose that all National Organizations members of WFEO prepare a report on the basis of the guidelines and information that the model requires.



– Relationship between Theory and Practice in EE. The theme was proposed by Dr. Vollrath Hopp, who expressed the importance of having a balanced relationship between theoretical knowledge and practical experience. A broader discussion on this theme will be proposed at the joint Committee WFEO-UATI on Industry-University Cooperation.

– Continuing Engineering Education. The theme was proposed by Prof. Leizer Lerner who is a member of the Organizing Committee for the 6th World Conference on Continuing Engineering Education that should take place in Sao Paulo and Rio de Janeiro, Brazil, between 8-12 May, 1995. Prof. Zenon Pudlowsky speaking on behalf of Prof. Terry Duggan (U.K.) at present President of the „International Liaison Group on EE” (ILGEE) with headquarters in the University of Sydney, Australia proposed that our WFEO CET participate in the programmes of ILGEE in the area of CEE. The Committee decided that a Task Force formed by Prof. Jack Levy and Dr. D. Reyes-Guerra submit a project that would allow the Committee to become involved in Continuing Professional Development (CPD).

WFEO officers gave prestige to the Board of Authorities, among them the President Elect of WFEO Eng. C. Bauer. The Secretary of the Congress, also Chairman of the Organizing Committee, Prof. Saad El-Raghy performed a wonderful job, ensuring that each participant received the two volumes of the Proceedings of the Congress and personally seeing to each detail of the meetings.

Good recommendations were approved during the last Plenary Session addressed to Educational Institutions, Governments and UNESCO. A „Resolution on Accreditation” was assumed by the Congress with enthusiasm and adopted as a policy statement by the Committee. It was also decided that the second issue of IDEAS should present different Accreditation Systems through papers written by the members of the Committee.

The social events of the World Congress were full of emotions and colour. Sound and Light on the Pyramids, a Nile Cruise and a night at the Opera. During the Gala Dinner, the Ministry of Education awarded the Chain of the Order of Engineers of Egypt to W. Carroll, M. A. Yadarola, C. Bauer and other relevant engineers.

### **THIRD WFEO WORLD CONGRESS ON ENGINEERING EDUCATION AND TRAINING**

It took place in Cairo, at the Sheraton Hotel between 14-18 November, organized by the Egyptian Engineers Syndicate ESE, sponsored by UNESCO, FEANI, UATI, IAU, FAOE and FEISEAP. The main Theme: „Quality of Engineering Education – An International Perspective” was discussed in five Plenary Sessions and eight Parallel Sessions on the basis of 68 papers from 24 different countries. Over 300 persons participated.

The Opening Ceremony was presided by the President of WFEO Dr. William Carroll, Prof. M. E. Hashmy, representing the Minister of Education and the President of the WFEO CET Prof. M. A. Yadarola. Other

### **TWENTYFIRST MEETING – BUDAPEST 1995**

The Federal Chamber of Technical and Scientific Societies of Hungary (MTESZ) received in their magnificent headquarters in Budapest all the WFEO meetings: General Assembly, Executive Council and Technical Committees. At the General Assembly Eng. Conrado Bauer (Argentina) assumed the Presidency of WFEO for a four-year period.

The 21st Meeting of the CET was held on 4-5 October, 1995 with the participation of the President and the following Full Members: Prof. L. Lerner (Brazil), Mme. R. Petrikova (Czech Republic), Prof. Shen Shi Tuan (China), Dr. D. Reyes-Guerra (El Salvador), Prof. K. Imai (Japan), Dr. H. Al Sanad (Kuwait New Member), Mme. Dr. B. Joséfowicz (Poland).

At the start of the meeting the following were present: Eng. Conrado E. Bauer, now WFEO President, who expressed his trust in the contributions that the committee will continue offering WFEO so that the organization can contribute towards the improvement of the quality of the formation of future engineers. Also present was the President of MTESZ, Dr. Gábor Náray-Szabó who welcomed the members and commented on the special attention paid by MTESZ to engineering education through Hungarian Universities.

Prof. Laszlo Felföldi has resigned as Full Member due to health problems and in his position MTESZ has nominated Dr. Frigyes Geleji who did not participate in the meeting. Dr. Russel Jones also resigned as Alternate Member, having been elected Executive Director of the National Society of Professional Engineers NSPE.

The following matters were considered during the meetings:

– Internal By Laws. A project of Internal By Laws was submitted by Prof. Yadarola to complement matters that are not considered in the Internal Rules of Procedure for WFEO Committees such as:

- i) Election of new President and transition between two headquarters
- ii) Responsibility of the WFEO National Member that holds the presidency and headquarters of a WFEO Committee
- iii) Activities and responsibilities of the President and members.

Several members enriched the President's project and after its approval it was decided to submit it to the WFEO ExCo.

– Election of Vice Presidents and Board. According to the By Laws two Vice Presidents were elected. Prof. Jack C. Levy and Dr. David Reyes-Guerra. The Board of three members is complemented by Dr. Kaneichiro Imai.

– 1996 ASEE International Conference and the next meeting of the Committee. The

President of the American Society for Engineering Education, ASEE, Dr. Ray Bowen invited the members to participate in this Conference in Washington DC on 21-22 June, 1996 and proposed that the 1996 Meeting of the Committee be held after the Conference, on June 22-23.

– Award for Excellence in Engineering Education. A project is presented by Prof. Yadarola with a draft of By Laws that foresee the granting of up to three awards every two years to engineering educators that contributed towards the improvement of the formation of future engineers. A non-explicit objective is that the diffusion of this WFEO Award will mean that the Organization will be widely acknowledged in Faculties and Schools of Engineering. It was decided to submit this project for the approval of the 1996 WFEO ExCo.

– Diffusion and Implementation of Recommendations. Prof. Yadarola explained the reasons for this topic „What value do the Recommendations of so many Congresses, Conferences and Seminars have if they are not properly diffused and implemented?” If they do not have a well structured worldwide organization capable of fostering and monitoring related projects? WFEO should be involved in this task through our CET. It was decided to create a W.G.

– Journal IDEAS. In different academic and professional media the Committee's publication IDEAS has been highly praised. The Journal is intended to express the most important matters in engineering education, professional practice and accreditation discussed by the members in the annual meetings. Issue N° 1 included papers on Distance Learning and N° 2 distributed early 1995 was dedicated to Accreditation of Engineering Studies.

– Accreditation of Engineering Studies. According to Prof. Al-Sanad, the Committee should study and propose a general accreditation system that can combine the ABET system that accredits engineering studies and that

of FEANI that accredits the title, the „product”. Prof. K. Imai agrees with a worldwide system of evaluation-accreditation that could open the door to the „Global Engineer”. Due to the interest awakened by this subject it was decided that N° 3 of IDEAS publish papers on „Accreditation and Professional Practice”.

– Creation of Working Groups and appointment of Coordinators. This initiative by the President has been included in the 1995-96 Plan of Action that will be submitted to the WFEO Assembly. Among the Full Members it is resolved to form the following WG with their Co-ordinators:

*WG1* – Accreditation – Quality Assurance.  
Prof. Jack Levy

*WG2* – Curricula Design (together with Committee on EE) Dr. Kaneichiro Imai

*WG3* – Continuing Engineering Education  
– CPD Prof. Vollrath Hopp

*WG4* – Cooperation Industry-University –  
Mme. Nicole du Vignaux

*WG5* – Distance Learning in Engineering  
– Dr. David Reyes-Guerra

*WG6* – Database in Engineering Education  
– Dr. William Sangster

*WG7* – Compilation of Recommendations of Congresses and Conferences – Prof. Leizer Lerner

– Election of a new President and Headquarters. Prof. Yadarola reminds the members of the Committee that his second four-year term comes to an end in 1997 and that the task of finding a WFEO National Member willing to take over the headquarters and presidency must be performed during this year 1995 so that at the next meeting of the Committee in Washington 1996, the proposals can be evaluated and a recommendation submitted to the WFEO ExCo. Prof. Yadarola informs that he has asked the Secretary General Eng. John C. McKenzie to approach the WFEO Members indicating the background and information that a proposal should contain according to the Internal Rules of Procedure and anticipating their being put in force, the Internal By Laws approved at this meeting.

– Joint Meeting with WFEO Committee on Technology Transfer (TT). Before ending the Annual Meeting all the members held a joint meeting with the WFEO Committee on TT chaired by Dr. James Poirot.

Several possibilities of joint actions were analyzed and among them, to hold an International Symposium in Rio de Janeiro before the WFEO ExCo meeting scheduled for October 8-10, 1996. The following Panels were suggested:

i) Technological Evolution.

ii) R&D and Innovation.

iii) Technology Transfer through CEE.

## **TWENTYSECOND MEETING – WASHINGTON 1996**

At the Headquarters of the US National Academy of Engineering in Washington D.C. the 22nd Annual Meeting was held on June 24,25, 1996 with the participation of the following members and invited guests: Full Members: prof. M. A. Yadarola (Argentina – President), Prof. Leizer Lerner (Brazil), Dr. Anwar Hossain (Bangladesh), Dr. Ruzena Petrikova (Czech Republic), Dr. David Reyes-Guerra (El Salvador), Dr. Frigyes Geleji (Hungary), Prof. Kaneichiro Imai (Japan), Dr. Hassan Al Sanad (Kuwait), Dr. Bozenna Joséfowicz (Poland) and Prof. Jack C. Levy (UK). Alternate Member: Prof. Yasushi Takeuchi (Japan). Invited Guests: Prof. David Thom (New Zealand – WFEO Vice President), Dr. Russel Jones (USA – Executive Director NSPE), Dr. Carolyn Freeland (USA – Executive Director IACEET), Dr. Boris Mitin (Russia, President, Russian Association for Engineering Education – RAEE), Dr. Alexei Nesterov (Russia, General Director RAEE). Informed that WFEO President, Eng. Conrado Bauer will not be present in Washington for this meeting, Prof. Yadarola invited Eng. Donald Laplante from Canada, who was Vice President of WFEO but he was not able to attend.

– Members Activities Report. In order to improve interaction and make the Commit-

tee's activity more efficient, this modality to receive at each meeting a report of activities was successfully introduced at the first meetings of Prof. Yadarola's presidency. It is worth while pointing out that particularly at this meeting, the Activities Reports of the members constituted a means to analyze and make a critical review of the educational systems of each country; evaluation, accreditation and quality control; professional practice, license and registration; selection and tenure of the professors; continuing education programmes; cooperation industry-university; as well as other aspects. The discussion of these items took up half a day of work and filled several pages of the Minutes.

- World Congress of Engineering Educators and Industry Leaders. This meeting will be held in Paris next July (2-5) and is organized by UNESCO together with WFEO and UATI in homage to the 50th Anniversary of UNESCO. It shall be the last of the global meetings of educators and industry leaders. Several members of the Committee submitted papers. The President comments that he himself is Co-Chairman of the Programme Committee and has been asked to work as one of the three Rapporteurs that must prepare a summary of the Recommendations.

- International Symposium on Continuing Engineering Education for Technological Development. The Symposium is an initiative of FEBRAE, the WFEO National Member for Brazil and will be held on 8-10 October, 1996 in Rio de Janeiro simultaneously with the Annual Meeting of the WFEO ExCo and several Technical Committees. Prof. L. Lerner will represent our Committee, and Eng. James Poirot the WFEO Committee on Technology Transfer in the organization of the Symposium.

The following members will take part as panelists: Prof. Jack Levy, Dr. Kaneichiro Imai and Dr. Reyes-Guerra. Prof. Yadarola proposes that the three panelists together with Prof. Lerner form part of the Board of the Committee and that a meeting be scheduled for those days.

- 4th World Congress on EE&T. Prof. Yadarola expresses his deep concern about the lack of information on the status of the organization. No call for papers has been sent so far. No press information in specialized magazines and bulletins. It was assumed that the Institution of Engineers, Australia would present a complete report at this meeting but there were several internal changes that forced the authorities not to pay proper attention to the Congress until several days ago. A specialized company is to be hired for the organization in spite of Prof. Yadarola's advice to involve engineers, professors and students in the task. Prof. David Thom, on his way back to New Zealand, offers to contact personally WFEO Vice President Eng. William Rourke and also the Board of IEAust.

- 5th World Congress on EE&T. A proposal of the Polish Federation of Scientific and Technical Associations NOT to hold the 5th World Congress in Warsaw, in September 2000, was submitted on June 17 and widely complemented at this meeting by Dr. Bozena Joséfowicz. It was decided to accept the proposal and to thank NOT and Dr. Joséfowicz for their good will in taking over this responsibility.

- New Headquarters and President for the Committee. Only one proposal has been submitted in time for consideration at this meeting: MTESZ from Hungary for the Headquarters and Dr. János Ginsztler for the presidency. But it is incomplete because important background information is missing. The only documents sent are: the letter of proposal and a CV of Dr. Ginsztler. Dr. Frigyes Geleji complements orally the information lacking. The Committee decided to accept to proposal of MTESZ and to request this organization to complete the information missing before the meeting of the Board in Rio de Janeiro. It was also decided to invite Dr. Ginsztler to meet with the Board in Rio.

- Working Groups. Outcomes expected. No reports have been received on the tasks performed by each WG since the last meeting in Budapest. Prof. Yadarola expressed that

perhaps it is too early to expect results, bearing in mind that the Coordinators do not have a budget assigned and they must turn to the support of the WFEO National Member or some other organization in their country. It is the opinion of the President, that the SEFI WGs represent a model that operates well and deserves being imitated. „There is a lot of valuable work already made that may help to organize the task of each WG in order to prepare documents that can be analyzed in our meetings and published in IDEAS”.

– Journal IDEAS. Issue N° 3 of IDEAS, dated January 1996, was widely distributed among Engineering Faculties, Members of WFEO and key people in the field of engineering education, accreditation and practice. The publication has been dedicated to UNESCO in its 50th Anniversary with an Editorial written by the President that deserved a letter of praise from Dr. Adnan Badran, Deputy Director of the Organization. The main theme of this third issue „Accreditation and Professional Practice” was developed in eight different papers. The members of the Committee, while congratulating the President for the quality of the publication exhort him to continue with the editorial task that means a note of prestige for the Committee and for WFEO.

– Matters outside the Agenda- Two important Reports were brought to the meeting:

Mme. Dr. Carolyn Freeland Director of IACET, International Association for Continuing Education and Training, made a presentation on the purposes, objectives and programmes of this organization.

Dr. Lionel Baldwin, President of NTU, National Technological University of USA presented the status of production and transmission of distance learning courses, areas covered, costs and possibilities of cooperation.

### **MEETING OF THE BOARD – RIO DE JANEIRO 1996**

On October 9, at the Othon Palace Hotel of Rio de Janeiro the meeting of the Board of

the CET was held under the auspices of FEBRAE, the Brazilian Federation of Engineering Societies. The meeting was simultaneous with the WFEO Executive Council Meeting and the International Symposium on Continuing Engineering Education for Technology Development.

The meeting of the Committee on E&T was attended, besides the President, by the two Vice Presidents, Dr. Jack Levy and Dr. David Reyes-Guerra as well as two members of the Board, Dr. Kaneichiro Imai and Prof. Leizer Lerner. Unfortunately President Elect Dr. Janos Ginsztler was not able to attend. Matters analyzed covered:

- i) the work of the seven Working Groups,
- ii) the organization, new dates and diffusion of the 4th World Congress,
- iii) the 1997 Annual Meeting in Sydney
- iv) Transfer of the Headquarters and Presidency to be performed at the GA in Hong Kong
- v) meeting with Prof. Ginsztler to update him on the Committee activities
- vi) Committee's participation in the Plan of Action of WFEO
- vii) Projects of declarations to be presented at the EAC in Rio
- viii) Main themes for the Journal IDEAS N° 4 and N° 5
- ix) Performance of an International Seminar of EE Societies and Committees.

### **MEETING WITH THE PRESIDENT ELECT – BUENOS AIRES 1996**

The President Elect of the WFEO CET Dr. János Ginsztler agreed to travel to Buenos Aires, Argentina to meet President Yadarola and to receive there all the necessary information to take over the continuity of actions of the CET, at the new Headquarters of the Committee, MTESZ in Budapest. The meetings were held on 11-13 December 1996 at the Headquarters of UADI, Argentine Federation of Engineering Societies and demanded to complete days. The President of WFEO, Eng. Conrado Bauer (Argentina) honoured

with his presence the meeting of December 12 in the morning.

Different aspects were analyzed, related to the history of the Committee, its organization, members, regulations, the Minutes of 8 Annual Meetings of the CET chaired by Prof. Yadarola and also the Minutes of the Board in Paris (94) and Rio de Janeiro (96) and the results of the Intercommittees Meeting of Madrid (90). The most outstanding aspects of each of the Annual Reports of Activities and the Action Plans 91-93/93-95/95-97 were analyzed. Also the conclusions and recommendations of the 3 World Congresses organized by WFEO: Kathmandu, Nepal 1987, Havana, Cuba 1991, Cairo, Egypt 1994 and details of how they were organized and results obtained. The economic aspects regarding resources and normal expenses of the Committee were also analysed by means of the Annual Budgets and Balances. Finally the revision of WFEO activities and the rest of its Technical Committees, Executive Council, National and International Members was performed. A complete dossier with copies of all the above mentioned documentation was delivered to Prof. Ginsztler.

During his stay in Buenos Aires Prof. Ginsztler was received by authorities in the field of Argentine engineering, as well as by the Secretary of University Policies of the Nation, Rectors and Deans of Universities of Buenos Aires. President Yadarola and his wife greeted Dr. Ginsztler during his stay in Buenos Aires with a dinner at a typical and picturesque dinner-show establishment „Mr. Tango”.

### **TWENTY THIRD MEETING – SYDNEY 1997**

The beautiful City of Sydney together with the warm attention offered by the hosts, were a stimulating setting for the development of the CET meeting and the 4th World Congress of EE&T.

The 23rd Meeting of the CET lasted two days beginning on 19 November 1997 and fin-

ishing on November 21. They were held at the Headquarters of The Institution of Engineers, Australia. To open the first meeting, the President of IE Aust Eng. Barry Grear expressed his gratefulness to the President and Members of the Committee for having chosen Sydney to hold the CET meetings and invited the participants to a Welcome Dinner. Similar terms were expressed to those present by Vice President of WFEO Eng. William Rourke (Australia). Another two Vice Presidents of WFEO were present: Eng. I. Akitunde (Nigeria) and Prof. David Thom (New Zealand) and also the Chair of the 4th World Congress Dr. Elizabeth Taylor and the President of the Australasian Association for Engineering Education Prof. Erin Jankaukas.

President Yadarola warmly welcomed President Elect Dr. János Ginsztler and the person who shall be the Secretary of the Committee in its Budapest Headquarters Mr. Zsuzanna Sárközi Zágóni. The following Full Members attended the 23rd meeting: Eng. Harry Wragge (Australia), Prof. Anwar Hossain (Bangladesh), Prof. Leizer Lerner (Brazil), Mme. Dr. Rusena Petrikova (Czech Republic), Prof. Shen Shi Tuan (China), Dr. Vollrath Hopp (Germany), Dr. Kaneichiro Imai (Japan), Dr. Hassan Al-Sanad (Kuwait), Dr. Bozenna Jósefowicz (Poland) and Prof. Jack Levy (UK).

– New Headquarters of the CET. Dr. J. Ginsztler outlined the facilities of the future Headquarters of the Committee at the Central Offices of METSZ in Kossuth Square, Budapest. He asked the present Members of the Committee to try and have their positions reconfirmed by the WFEO National Member because he is conscious that with them he will be able to count on the support of people with capability and experience. He also asked Prof. Yadarola to continue on the Committee as Past President.

– New Headquarters for the WFEO Secretariat. Eng. William Rourke informs that at the meeting of the WFEO Executive Board in London on 21-22 March 1997 all necessary conditions to transfer the WFEO Headquar-

ters of WFEO to the UNESCO Building in Paris were verified. The present Secretary General John C. McKenzie is giving the final touch to the transfer of the offices from London to Paris, together with the transfer of all documentation of the Secretariat. In December 1997 the WFEO Headquarters in Paris will be definitely installed under the direction of Eng. Pierre-Edouard de Boigne as Executive Director. Besides the facilities that UNESCO offers generously in their Building, the French Government has also granted a subvention of FF 120:00 or US\$ 19.000.

– Report on the activities of the Working Groups. Only four WG reported actions:

*WG1, Accreditation* Prof. J. Levy: a questionnaire was sent to the National Members and several answers were received. The concept of Accreditation is being refocused taking outcomes into account as more significant than evaluation of programmes. On the other hand, the FEANI agreement points to the acknowledgement of degrees.

*WG2, Curricula Design.* Prof. K. Imai tabled a Plan of Action and invited the members to send comments.

*WG5, Distance Learning.* Dr. Reyes-Guerra sent a written report suggesting a framework that will allow working with the Universities and the WFEO National Members.

*WG6, New Educational Technologies.* Dr. Bozenna Joséfowicz reported a wide discussion between the members by e-mail. The Committee has started to prepare a register of all the modern educational technologies that are being used in higher education. This background will serve to structure the Theme for the 5th World Congress to be held in Warsaw.

– UNESCO International Committee on Engineering Education. This is the new version of what has been known as the UNESCO Steering Committee, reorganized under the direction of Prof. Hans Peter Jansen of Denmark. The objectives and programmes are similar to those of WFEO CET for which reason the members coincided in suggesting to the next President Dr. J. Ginsztler to try and coincide in joint programmes avoiding overlaps.

– Conference on Engineering Education for Sustainable Development. The Chairman of the WFEO Committee on Engineering and Environment Prof. David Thom and also organizer of this Conference, submits a report. It was held at the Ecole Nationale des Ponts et Chaussées in Paris together with UNEP and WEPED. Members of the CET participated: Prof. L. Lerner, Dr. A. Hossain and Prof. Y. Takeuchi.

– Special Reports. Ms. Zsuzsanna Sárközi Zágóni who will be as from this meeting the Secretary of the CET delivered a report on Experiences of Engineering Courses taught in foreign languages at the Technical University of Budapest. Dr. V. Hopp pointed out the changing requirements for engineering education and the need to move from emphasis on physics and chemistry to biology, interdisciplinary sciences and sociology. Communication skills and political understanding.

– UNESCO World Conference on Higher Education

A report was presented by Prof. Dr. Thom. This Conference, perhaps the most important meeting in the field of Education was going to be held on September 28, October 2 in Paris with three main goals: to widen access to higher education systems, to improve the management of this sub-sector and to reinforce its links with production and service sectors. Prof. M. A. Yadarola has been appointed by the Board of WFEO to represent the Organization at this World Conference.

#### **FOURTH WFEO WORLD CONGRESS ON ENGINEERING EDUCATION AND TRAINING**

A report is presented to the Committee by Prof. Yadarola and Dr. Elizabeth Taylor. They informed on the different stages of the organization of this Congress that was held after the first meeting of the Committee at the Carlton Crest Hotel – Sydney on 21-22 November, 1997. The Institution of Engi-

neers, Australia was the host engineering society with the sponsorship of the Australian Council of Engineering Deans, the Australasian Association of EE. Two regional engineering societies that are International Members of WFEO, FEISEAP and AESEAP also sponsored the Congress.

The organization of the Congress was significantly delayed, due to changes in the direction and it was only at the beginning of 1997 that the Organizing Committee with Dr. Elizabeth Taylor as Congress Chair started to send the First Announcement to different engineering institutions. The Final Program was sent in August 1997. The main theme was: „Professional Development for Global Engineering Practice” that was dealt with by 28 papers from the 53 registered participants, 18 of which were from other countries. The Opening Ceremony was chaired by Vice Presidents of WFEO, W. Rourke and Prof. D. Thom, the President of IEAust Eng. Barry Grear and by the President of the WFEO CET.

Two workshops allowed a concentrated task, extremely productive, encouraging the discussion of themes by all participants:

1. How do we Best Change the Culture
2. What are the Pathways to Global Engineering Practice

The final Conclusions and Recommendations were written by Eng. B. Rourke and Prof. M. A. Yadarola and presented at the WFEO General Assembly of Hong Kong on the first days of December 1997.

One of the social events of the 4th World Congress, that remains in the memory of the Participants, was the dinner served aboard a ship that cruised the beautiful Bay of Sydney with music and dancing.

– 5th World Congress on EE&T. The Warsaw see was confirmed by the Polish member of the Committee Dr. Bozenna Joséfowicz as well as the dates: September 12-14, 2000. The organization will be under the responsibility of NOT, the Polish Federation of Engineer-

ing Associations and the main theme „Improving the Innovative Capacity of Students and Teachers and New Educational Techniques and Technologies”. Sponsors will be FEANI, IGIP and the Conference of Rectors of High Technical Schools. Financial and technical support has been requested from companies such as Alcatel, TPSA, Gandalf and the State Committee on Scientific Research (KBN). All this information was also prepared to be presented at the WFEO General Assembly to be held in Hong Kong in December by the President of NOT. With the approval of the Assembly the 5th World Congress will be the most relevant activity for WFEO in the year 2000.

– Certificate of Appreciation for the Members. Before ending the last meeting under his presidency, Prof. Yadarola expressed his profound gratefulness to the Members of the Committee that had accompanied him in his task, admitting that all of them, without exceptions, meant a strong support for the plans and programmes discussed and implemented during eight years of continued work. To show his acknowledgement to that task, that was also an acknowledgement of the entire Federation, he delivered a Certificate of Appreciation to each Member, signed by the President of WFEO, Eng. Conrado Bauer and by the President of the CET.

## EPILOGUE

After writing this history that covers a period of 27 years (1970-1997) the author expresses his satisfaction to see that the history of the WFEO CET will not stop during the following years. The Budapest Headquarters MTESZ and the leadership of its present President Dr. Janos Ginzstler have widened the horizon of the Committee increasing its prestige and its presence before the principal organizations of engineering education in the world and in the environment of the National Engineering Federations members of WFEO.

A new headquarter in Warsaw, Poland proposes to maintain and strengthen the objec-



tives and purposes that were consolidated through the previous sees: Canada, Dr. James M. Ham, India: Dr. Amithaba Bhattachayya, Argentina: Prof. Miguel Angel Yadarola and Hungary Dr. Janos Ginzstler. The new President, Dr. Włodzimierz Miszałski with the support of the WFEO National Member in his country, NOT, will commence in 2005 a new period of the WFEO CET with Headquarters in Warsaw, Poland. Dr. Miszałski is an active participant in many activities aimed at the formation of engineers with a holistic vision for a world that will

demand from them „self improvement attitude, creativeness, innovative capacity, initiative, adaptiveness and a solid conviction of the civilizing mission of technology”. Dr. Miszałski received a M.Sc. degree in Computer Science and Operations in 1972 and a D.Sc. degree in Technological Science in 1984. In 1991 he was awarded with a Ph.D. in Management and Command and in 1993 he graduated from the National Defense University, Washington USA. At present, Dr. Miszałski is Professor of the Military University of Technology, Warsaw, Poland.

## WFEO EXECUTIVE COUNCIL

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Past President: Prof. Dr. Eng. José Medem (Spain)  
President Elect: Eng. Kamel Ayadi (Tunisia)  
Treasurer: Eng. Stefanos Ioakeimidis (Greece)  
Deputy Treasurer: Prof. Jean Michel (France)

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Prof. János Ginsztler (Hungary) Education and Training (CET)  
Eng. Ganesh P. Lal (India) Engineering and Environment (EEC)  
Eng. Gilberto Toledo (Puerto Rico) Technology (ComTech)  
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Eng. Jorge Spitalnik (Brazil) Committee on Energy (CE)

Secretary General: Ms. Tahani Lefebure (Belgium)

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Past President: Prof. Miguel A. Yadarola (Argentina)  
President Elect: Prof. Włodzimierz Miszański (Poland)  
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Prof. M. A. K. Azad ( <i>Bangladesh</i> )	Prof. Husain Al-Khaiat ( <i>Kuwait</i> )
Prof. Leizer Lerner ( <i>Brazil</i> )	Fouad Daher ( <i>Lebanon</i> )
Dr. Ruzena Petrikova ( <i>Czech Republic</i> )	Prof. Fernando Ocampo Canabal ( <i>Mexico</i> )
Prof. Xila S. Liu ( <i>China</i> )	Eng. Jalal Al-Dabbeek ( <i>Palestine</i> )
Dr. David Reyes-Guerra ( <i>El Salvador</i> )	Eng. Pavol Molnar ( <i>Slovak Republic</i> )
Dr. Nicole Bécarud ( <i>France</i> )	Eng. Andrew Ramsay ( <i>United Kingdom</i> )
Dr. Vollrath Hopp ( <i>Germany</i> )	Mr. John Whitwell ( <i>United Kingdom</i> )
Eng. Stefanos I. Ioakeimidis ( <i>Greece</i> )	Eng. Jeremy Ascough ( <i>Zimbabwe</i> )

Secretary: Mrs. Zsuzsanna Sárközi Zágonyi (*Hungary*)

## ALTERNATE MEMBERS

Eng. Enrique Melara Ruiz ( <i>El Salvador</i> )	Dr. William S. Butcher ( <i>USA</i> )
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## CORRESPONDENT MEMBERS

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**12**