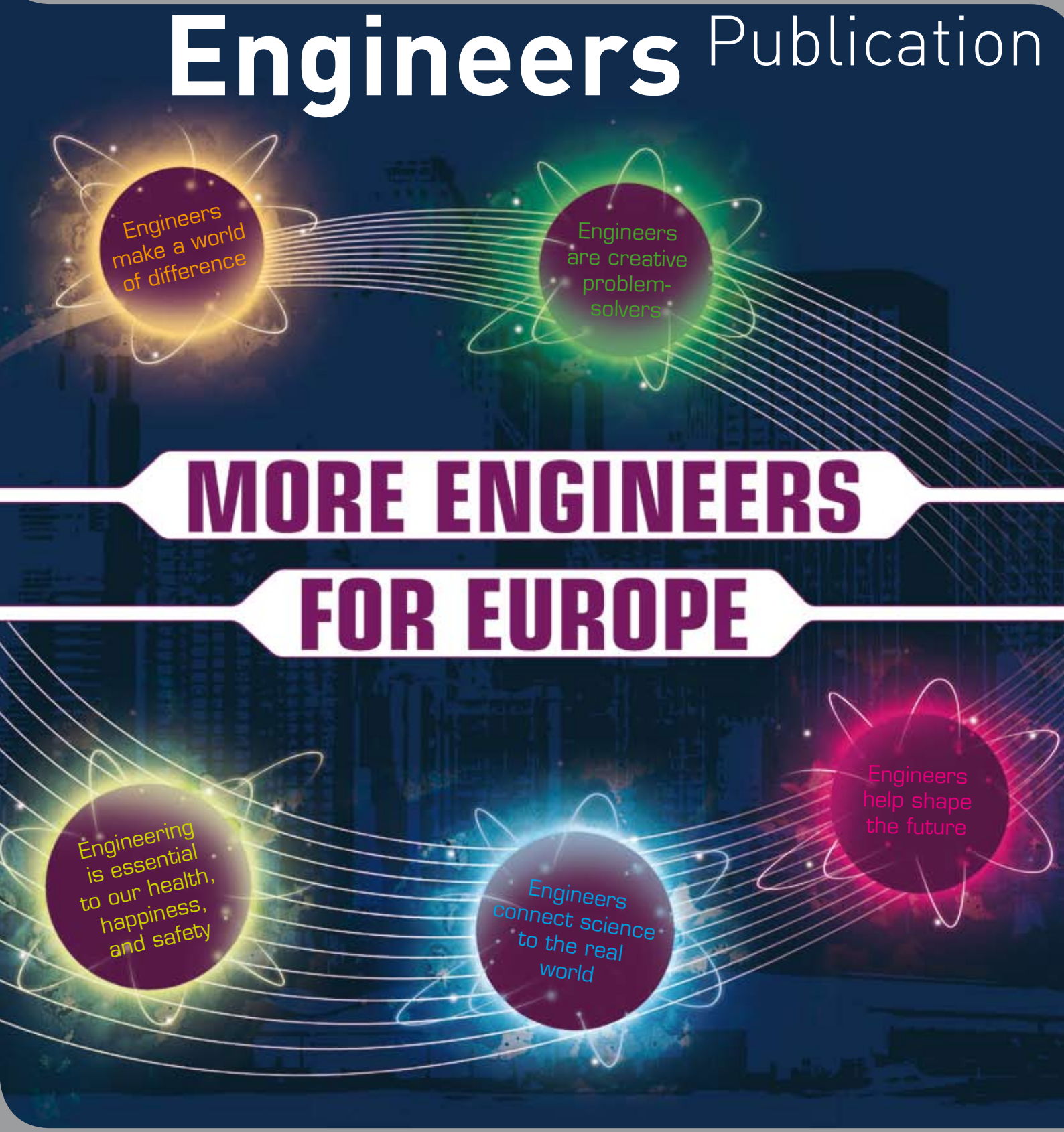
FEANI NEWS

The EUROPEAN Engineers Publication



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Editorial

Public understanding of Engineering:

DID WE ALL USE THE WRONG MESSAGE?

Author: Philippe Wauters
Secretary General of FEANI

It is today well known that in developed countries, as it is the case in the EU, we observe a decline of interest in scientific and engineering studies among the young generation.
This has been confirmed by several independent reports (see "References" at the end of the article) and has already been brought since many years to the attention of the public authorities of the EU countries, the EU institutions, education Institutions and the public at large.

This decrease in interest is however not evenly spread in all the EU Member States. The percentage of graduate engineers a country "produces" per year compared to the total number of graduates, all disciplines included, varies among the countries as well as the demand for engineers. The latter is dependent on the economic and industrial situation of each country.

However, if the demand varies from country to country, for Europe as a whole the total demand exceeds the total offer. Large companies today have to import engineers from outside Europe or have engineering activities be performed abroad. The necessity to attract the young generation for studies in science and engineering and to embrace the engineering profession is thus not only a Member State national problem but also a European one.

However, until now, following an agreement between the EU Institutions and the Member States, the responsibility to find solutions to solve that issue is under the responsibility of each country and not at European level.

Does this make sense?

Would a coordinated and well-targeted action under the umbrella of the EU Institutions not be more promising and/or complementary to individual activities that exist today in a limited number of countries (whereby the success or failure is not shared with the other countries)?
What could the EU undertake to complement the actions or to initiate new ones?

In a report of a very detailed study by the High Level Group on Human Resources for Science and Technology, appointed by the EU Commission, on "The crisis in the production of human resources for science and technology" dated 2002, covering almost all EU countries, several recommendations for actions were formulated aimed at reversing the trend in the "production" as reported by the study.
It was stated in the report that some of the actions recommended could directly be implemented in the framework of the European Research Area while some others at national or international level.

The EU Commission has indeed started projects in the Framework Program on Research – corresponding to some of the recommendations.

Among those actions, the University Business Forum aims at initiating reviews of the Higher Education system to ensure a better match between the education, the professional training and the industry need. Indeed, the Higher Education system is still today largely patterned for a preparation for academic careers.

One should however observe that all the actions initiated until now by the EU Commission, while being necessary, will give their results only on the long term as they all concern further development of the Higher Education system.

However, the necessity for 'More Engineers for Europe' already exists today, and we cannot wait for more decades until above actions give their results. There is thus an urgent need to accompany those actions with some others, likely to give results already on the short-term.

To do this, as investigated in the above mentioned study, the media (printed press, TV, radio, movies, novels, comics…) which is a key source of information/ intermediary between science and people, should be used to boost recruiting for science and engineering by presenting what engineering is, what the skills needed are, as well as the perspective of the profession. This means in fact using the media for a marketing campaign to reposition the profession of engineer in the mind of the students, teachers, parents, policy makers and the society at large.

This marketing should use well tested messages, having proven their attractiveness in the different categories of addressees as listed above.

Recently, the results of a study entitled '*Changing the conversion: messages for improving public understanding of Engineers*' conducted by the National Academy of Engineers in the United States have been published. The study was supervised by the Committee on Public Understanding of Engineering Messages, which consists of several university professors in engineering.

In the US, millions of dollars are spent every year to improve the public understanding of engineering. It seems that this huge investment gave only poor results until now: teachers and students still have a poor understanding of what engineers really do, the public does not associate engineers with societal and community concerns or with issues related to saving lives, the prestige of the profession is below medicine, nursing, science and teaching. Finally, this investment apparently did not increase the number of young people embracing engineering studies as the number remains steady since years.

There is thus a necessity to set up an action and a strategy to transmit a more accurate and a more positive image of engineering and to improve the public understanding of engineering.

Based on the preceeding facts, the Committee defined three objectives:
- Identify a number of messages likely to improve the public understanding of engineering
- Test the effectiveness of those messages
- Disseminate the result

In the framework of this study, a new positioning statement was developed (see statement below) which guided the study and aimed at being taken over by the engineering community as being the conceptual foundation for a new communication campaign.

This statement corresponds to a repositioning of engineering which emphasized that engineers make the difference in the world. Marketing messages from the statement will have to have the virtue of placing "Math and Science" (to be excellent in math is the most frequented attribute for an engineer in the public understanding, and which can be a barrier to engineering studies) as just two of the number of skills an engineer needs to have to be successful, as for instance collaboration, communication, teamwork, languages, finance, etc.

New Positioning Statement

No profession unleashes the spirit of innovation like engineering. From research to real-world applications, engineers constantly discover how to improve our lives by creating bold new solutions that connect science to life in unexpected, forward-thinking ways. Few professions turn so many ideas into so many realities. Few have such a direct and positive effect on people's everyday lives. We are counting on engineers and their imaginations to help us meet the needs of the 21st century.

Several messages have been tested during the study and four have been selected as performing very well on the selected audience:
- Engineers make a world of difference
- Engineers are creative problem solvers
- Engineers help shape the future
- Engineering is essential to our health, happiness and safety.

The success obtained in the framework of the study with this repositioning of the engineering profession, as well as the first derived messages, let the Committee that supervised the study believe that this constitutes the basis for a multi-year communication campaign to improve public understanding of engineering, make engineering more appealing and better understood by students, education, parents, policy makers and the society as a whole and ultimately contribute to attract more students for this discipline.

According to the Committee, activities to further refine the messages and taglines, targeted to the different addressees must be pursued within this communication campaign and a centralized planning is necessary to assure effective coordination and communication between all the engineering organizations involved in the campaign.

It is most interesting to note that two totally independent studies (the one ordered by the EU Commission and the one on 'Changing the Conversation) in two different continents come to similar conclusions about the advantage and the necessity of using the media as a contributor to attract more young people for engineering. This is however in contradiction with some other opinions that such efforts should be left exclusively at university level.

Using the media with well-dedicated and well-targeted messages in a new positioning communication may indeed have a positive effect; this has been proven on a small scale (in the US) by the recent study in the framework of 'Changing the Conversation'. The study strongly recommended implementing it on a large scale. A planning in this sense is under investigation by the Committee.

In view of the necessity for 'More Engineers for Europe', the European engineering community should be well advised to seriously consider the feasibility of such a 'repositioning' campaign in Europe, capitalizing on the results of the work already been done until now in the US, which can be immediately turned into action.

The issue 'More Engineers for Europe' being also a European issue, it would be logical to organize this campaign under the umbrella of the European Commission.

This would also complement and support other successfully finalized or still running programmes the EU Commission has financed until now, such as those for quality assurance in engineering education programmes (EUR-ACE project), ranking of universities (starting with engineering programmes), engineering professional card investigation (the card is now in implementation phase in several European countries).

In the coming month, FEANI, in association with VDI (Verein Deutscher Ingenieure), will discuss this point with the EU Commission and investigate the possibility for financial support. The success of the initiative will be of benefit not only to the engineering community but to the whole European community and will boost the competitiveness of Europe. ❑

References:

EU Commission (2002): '*The crisis in the production of human resources for science and technology*'

The National Academy of Engineering in the US (2008): '*Changing the Conversation – Messages for Improving Public Understanding of Engineering*' ISBN-13: 978-0-30911934-4

European Round Table of Industrialists (ERT) (2009): '*Mathematics, Science & Technology Education Report*' Available at http://www.ert.eu

Shell/Microsoft/INSEAD/FEB (2009): '*Who Cares? Who dares? – Providing the skills for an innovative and sustainable Europe*' Available at http://www.insead.edu/discover_insead/docs/WhocaresWhodares.pdf

BYE-BYE THE LISBON STRATEGY 2000-2010
WELCOME THE NEW EU 2020 STRATEGY

One of the objectives set with the Lisbon strategy was to boost Research-Innovation-Training to make Europe in ten years time until 2010 the most dynamic knowledge-based economy in the world, with expenses for Research equivalent to 3% of the GDP in each EU country. The results are unfortunately "unconvincing" despite all actions and programs put in place by the EU Commission.

A new strategy for the next 10 years, the EU 2020 Strategy, is therefore in preparation. The text is in review at the EU Institutions and will probably be made official beginning of March this year. It is expected that with this new strategy, the emphasis among the three domains mentioned above will particularly be set on 'Innovation'. The objective will be to transform research results into marketable products much more rapidly as it is today, which is a big handicap in Europe.

Transforming research results into products is without a doubt an engineer activity as it has been the core part of their education.

If it is confirmed that the emphasis will be on '**Innovation**', it would be advisable that in the EU 2020 strategy documents, the terms "**Engineer**" and "**Engineering**" explicitly appear in the chapters dedicated to 'Innovation'. The term "Scientist", which is often used in the EU documents to cover all scientific activities, is not explicit enough.

Being well aware of the lack of engineers in Europe, the new EU 2020 strategy has a chance to be successful and the objective to be reached only if the request for 'More Engineers for Europe' can be satisfied on a short, middle and long term. ❑

Need for Actions for **More Engineers for Europe:**

Further Arguments

Author: Philippe Wauters
Secretary General of FEANI

Not only FEANI but also other bodies present evidence for a need for coordinated action at European level in order to reverse the decline of young people's interest in engineering education and science in general.

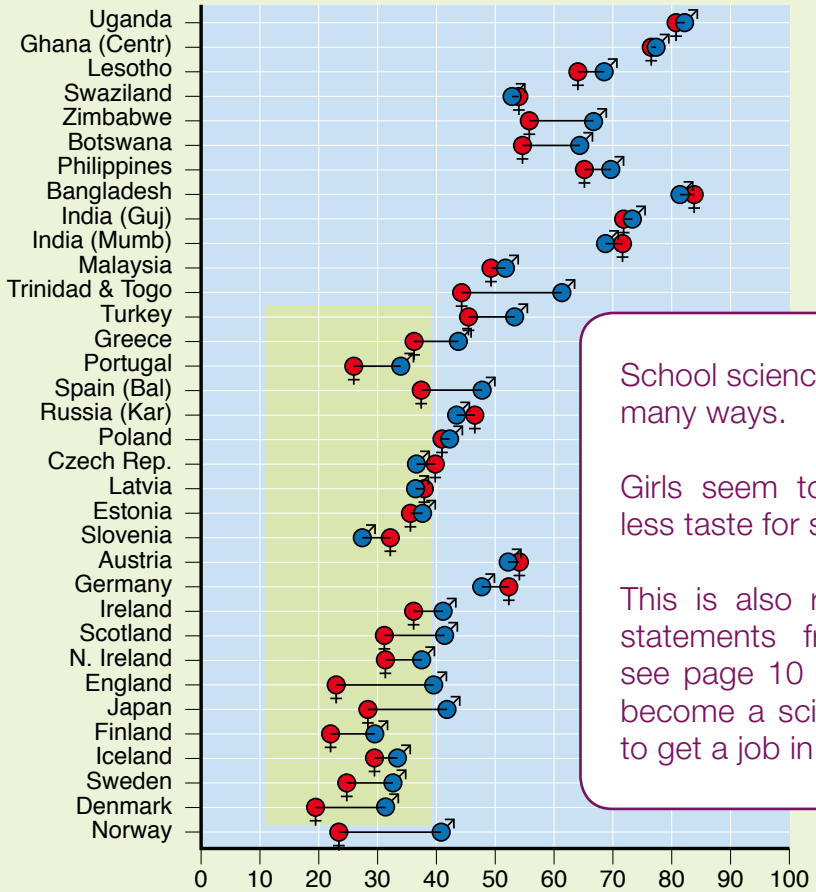
In its recent report on Mathematics, Science and Technology (MST) education, the ERT (European Round Table of Industrialists), a Forum of major industrialists in Europe, presents some diagrams on the lack of interest of young people in MST studies and careers in MST. ERT acknowledges the gap between supply and demand in MST, which is difficult to quantify at European level due to several uncertainties.

Attitudes

Attitudes on MST education and careers are believed to have a strong influence on the final number of MST graduates.

An international research project called The Relevance of Science Education (ROSE) has asked young learners at the age of 15 from more than 40 countries for their views on several aspects related to science and technology. The results reveal that the more developed a country, the less young people are inclined towards education and careers in MST. The countries on the Y-axis are presented according to the United Nations Human Development Index (the least developed countries are at the top and the most developed countries are at the bottom) and the X-axis is a scale from disagree (0) to agree (100).

Statement:
I like school science better than most other subjects



School science seems to have failed in many ways.

Girls seem to have developed even less taste for science than boys.

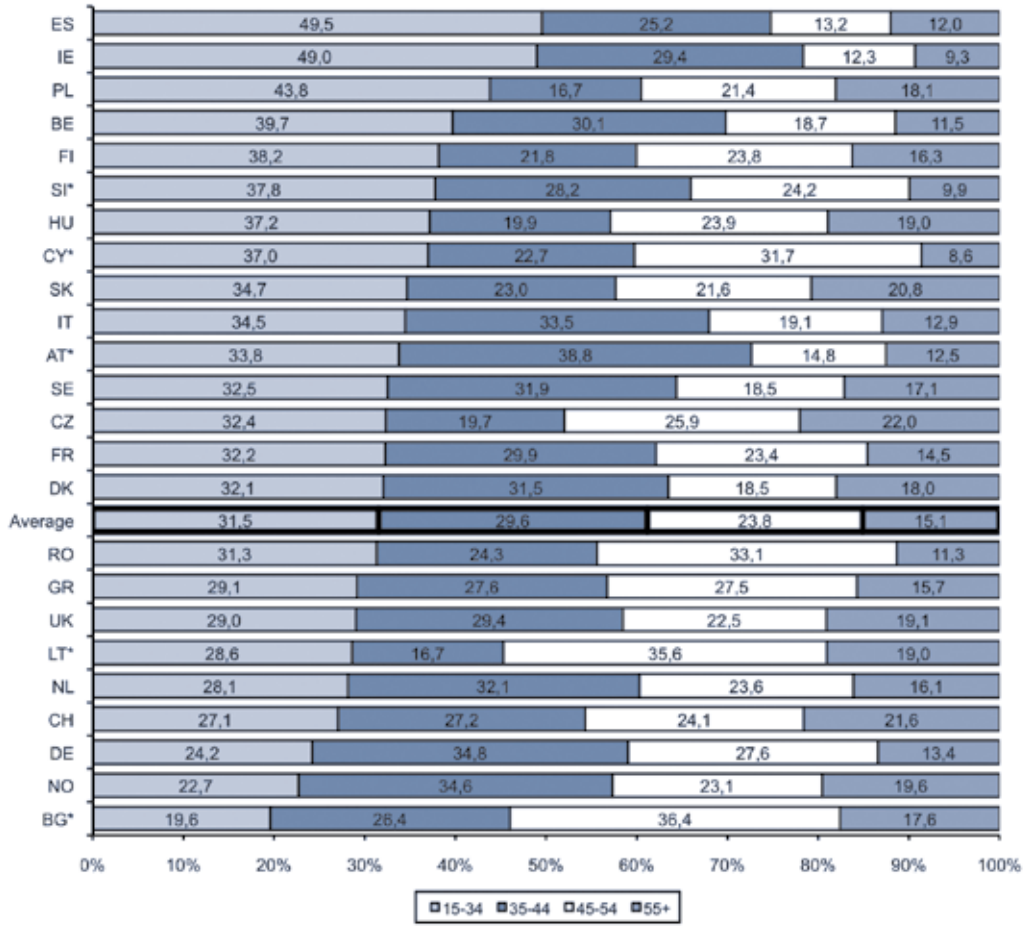
This is also reflected in the graphs/ statements from the ROSE study, see page 10 and 11: "I would like to become a scientist" and "I would like to get a job in technology".

Source: Sjøberg and Schreiner, ROSE Report 2008

The Age Structure of Engineers

Demographic change and the accompanying problems will continue to influence the European labour market in the years to come. The current age structure of engineering workers is an indicator of the impact that aging will have on the engineering profession in the future: Engineering workers aged 55 years or older today will most likely leave the workforce within the next ten years. Young engineers will then be required to fill the void and ensure the competitiveness of companies employing engineers. A low share of young engineering workers – usually going hand in hand with a comparatively low number of engineering graduates – is one of the major determinants of imminent engineer shortages in the labour market. The following graph shows the age structure of employed engineering workers in 26 European countries in 2007.

Age structure of employed engineering workers in 2007



*** Data reliability limited due to small sample size.**
Numbers rounded.
Source: Eurostat, 2009a

The graph Age structure of employed engineers in 2007 (European Engineering Report – Institut der Deutschen Wirtschaft in Köln, December 2009) shows that in most European countries, a large number of engineers will disappear from the workforce in the next ten years. This graph and the above mentioned information, clearly indicate that a small number of engineer graduates, which is the logical consequence of the lack of interest as demonstrated in the ERT diagram, will be a predominant factor of an imminent shortage of engineers.

The message from those diagrams alone should motivate political and educational authorities to initiate measures. It is therefore urgent, besides the long term actions already underway to improve the engineering education and adapt it to today's industry needs, to also start short term actions as those proposed in the preceding article, joining forces with the ERT proposal.

ENGINEERING SOLUTIONS ARE NO SILVER BULLET, BUT…

…THERE IS NO SUSTAINABLE FUTURE WITHOUT THEM

Author: Hans van der Loo
Head European Union Liaison at Royal Dutch Shell

Education has long been acknowledged as the cornerstone of Europe's success. With the challenges ahead, it will become even more important in determining the future of Europe's prosperity and role in the world. Competency in mathematics, science and technology (MST) is becoming more and more fundamental as strategic enabler for a sustainable, innovative and competitive Europe. Yet shortages in these disciplines are already imminent, calling for measures to substantially curbing this downward trend in enrolment in technical studies and restore the health of the *European Talent Pipeline.*

The Challenge Ahead : exponential

Few people realize that we have entered an exponential era. This is because political, company, personal plans hardly extend beyond 5-10 years. When one looks at trends in generational terms or even in geological terms, it becomes clear that we are now living in an exponential era.

In the last 50 years the world's population has doubled from 3 to 6 billion people. In the next 40 years this may increase by a further 3-4 billion. Combined with economic development this increase may mean that demand for resources (energy, steel, water, etc) may well double. This in turn could cause unprecedented climate stresses and new geopolitical challenges.

A relatively new concept is 'carbon footprinting'. This can be done for industries, products, individuals, countries and indeed for the planet. Many scientists already agree that the current level of economic development indicates the planet may be living beyond its means. The Stern Report was very clear in spelling out the necessity to reduce Greenhousegas (GHG) emissions in 2050 by 50%.

This summarizes the road ahead : In just 40 years we have to provide 2x more resources and find ways to do so with 2x less GHG.

Technology : crucial role

Meeting the world's growing natural resource needs in an environmentally responsible manner is a tremendous challenge, and technology is essential to answering that challenge. Besides money, youthful brainpower and creativity are needed to lay the foundation for an innovative and sustainable Europe.

Obviously new, science-based policy frameworks will be needed. In this century we will also see the need for behavioural and societal changes. But technology will play a key role in eco-innovations: efficiency improvements, sustainable resource development and sustainable use (longevity, low weight, smart design, recyclability, etc) of materials as well as developing new materials (chemistry) and new (nano) technologies.

Every century has its characteristic infrastructure networks. For the 19th century these were the canals and the railroads. For the 20th century these were

motorways, airports, gas and telephone networks, sewage, underground systems. For the 21st century there will be characteristic infrastructures as well.
It is still early – we are in the 1910 equivalent of the 20th century and what did our ancestors know about the past century that we now know. However with that proviso it is likely that the following infrastructures will be characteristic for the 21st century :

- **High speed rail links** which will displace medium/ long distance car trips and short haul flights. If combined with better public transport, this will have an impact on personal mobility as well as the vehicles we use for this.
- **Fiberoptic data highways** will open the door to entirely new media (e.g. 3D hologram tele-conferencing giving a surreal sensation of 'presence' without the need to actually travel). Paving the way for this are ultra highspeed light switches, that will enable to use the speed of light for unprecedented bandwidth enabling many new innovative applications we can now only dream of.
- **Intelligent Smart Nets for electricity** that enable new ways of optimization by combining power and information, switching on/off appliances where this is not a problem to reduce peak demand, or through bi-directional streams blend in intermittent, decentralised renewable energy generation.
- **CO2 disposal infrastructure networks**, linking up coal fired power plants and energy intensive industries (cement, chemicals, refineries, steel, etc) to underground storage to recycle the carbon contained in fossil fuel, such that it does not affect the greenhouse gas balance in our atmosphere.

Interest in MST studies : inversely related to economic development

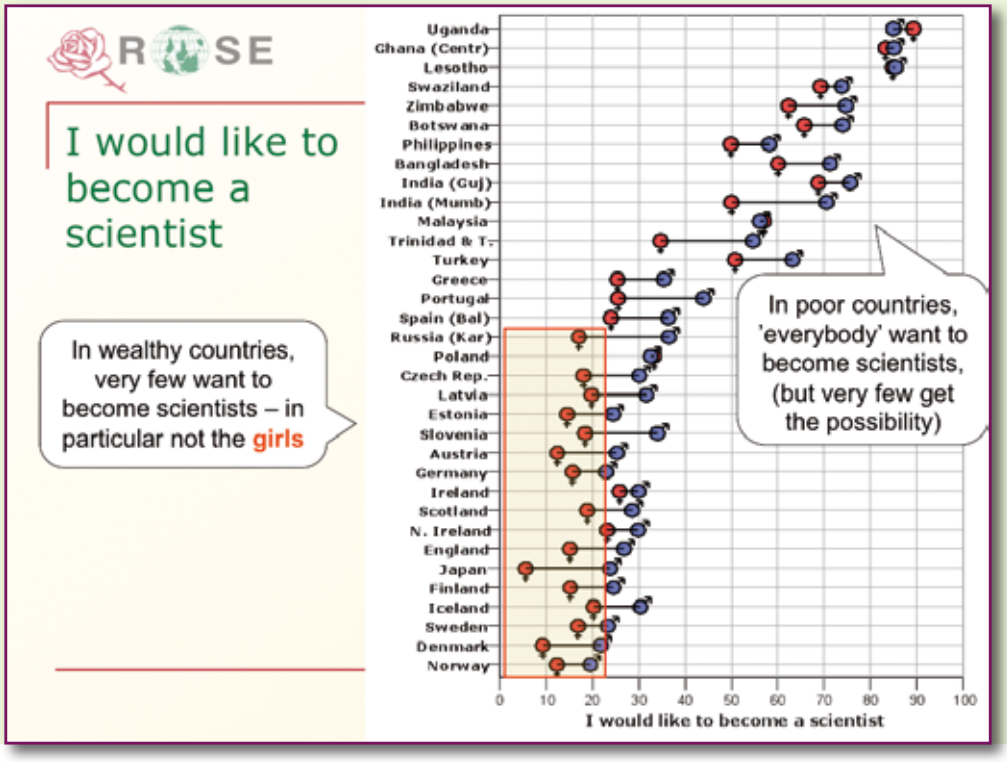
The challenges ahead, make the declining interest in Mathematics, Science and Technology studies amongst young European students a very serious issue. The absolute numbers have only slowly declined as the falling interest has been partly compensated by the increasing proportion of population that go into tertiary education. However, looking at the proportion of students choosing MST studies, a worrying trend is visible in most European countries, especially now that demographics are going into decline. Between 1998 and 2006 there has been 10.8% decline in the proportion of MST students in relation to the total student population.

To curb this trend will take time as talent development has a long lead time. It can be compared to pipeline management. First it requires input management ensuring there is sufficient inflow into the pipeline. What does not go in, can not come out. Then it requires throughput management, ensuring good flow and little leakage (drop outs) once the talent is at University, where it is developed, enriched into knowledge, competences and skills. Output management refers to the proper allocation of talent in society.

A study commissioned by the European Roundtable of Industrialists (ERT) came up with three findings typical for societies as they transition to higher wealth levels. Firstly, as society's get wealthier, its citizens become more proficient users of technology (Mobile phones, pocket computers, Navigation, etc). Paradoxically, at the same time they also become less interested in technology and how things work. This may be due to the combination of increased reliability of the technology, in many cases the low replacement cost, or the sheer complexity. This results in the second finding : as societies get wealthier, its youngsters are less attracted to MST studies and careers. A third finding is also interesting, although here there is a national/cultural difference.

Graph 1

Relevance Of Science Education (ROSE) study from Svein Sjøberg and Schreiner



In the Western world the profession that has dropped most in status compared to say 50 years ago is that of teacher. The exception are certain Asian countries such as China, Hong Kong, Japan, Singapore, where teachers still have higher status.

The Relevance Of Science Education (ROSE) study from Sjoberg and Schreiner conducted in 40 countries by interviewing young learners at the age of 15 for their views on several aspects related to science and technology, found that the more developed a country is, the less young people are inclined towards education and careers in MST. In graph 1 and graph 2 the countries on the vertical axis are ranked according to the UN Human Development Index. On the horizontal axis is the scale from disagree (0) to agree (100). It also found stark distinctions between boys (blue) and girls (red) interests.

Research suggests that today's youth wish to study and work on something meaningful that fits with their values and concerns and that they do not find or think that they will find this in MST. The ROSE report indicate that young people in the richer, more developed countries seem clearly less interested to dedicate their talent to science and technology. The researchers suggest that we may have passed the era in which the work of physicists, technicians and engineers is seen as crucial to people's lives and well-being. Today's youth will not make their choices because it is good for European competitiveness or because they may earn a good salary. They are more interested in *who* they will be rather than *what* they will do.

Role of Media : recreate 'positivism' around technology

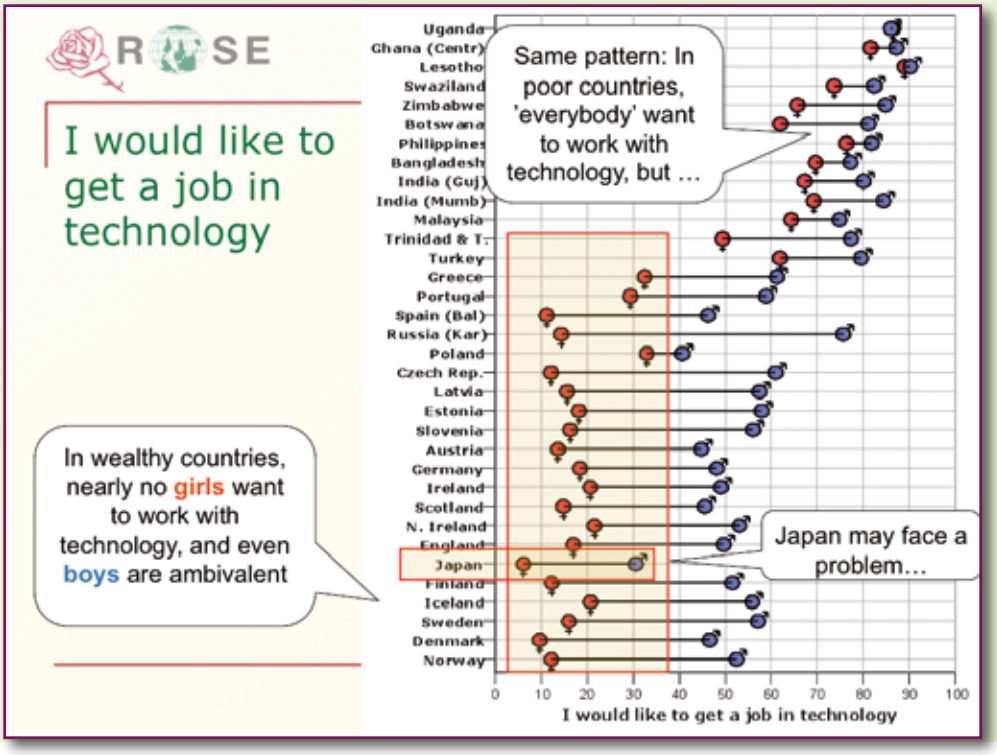
So there is clearly a mismatch between perceptions and believes on the one hand and the needed competencies and skills to meet the challenges ahead on the other hand. This gap may well be influenced by how technology is seen and portrayed in the media. Technology does not have the positiveness in society it once had. Society has lost its "Technologiefreudigkeit".
A Spanish Member of the European Parliament once told me she thought she understood why young people had lost interest in MST. When she was young she could read about new inventions nearly every week, this was no longer the case. I suggested this might not necessarily be the case because there are fewer inventions, but indeed because normal media have 'decided' it is not interesting anymore.

Negative stereotypes of scientists, engineers, researchers and other MST careers can be found amongst youth in most of the western world and especially Japan. There is a lack of attractive role models and a lack of information and understanding of what careers in MST are about.

There is also a significant gender issue in the MST area, with an insufficient number of girls taking up or being encouraged to take up these subjects. Too often teachers and career advisers, with little knowledge themselves of the opportunities offered by MST, still call on more traditional thinking that MST is more a male domain. There is also a real lack of female role models in this area, with girls seeing role models being more in humanities and teaching, especially at primary school and secondary school level.

As a result too many young Europeans opt out of MST subjects at an early age. Not only is this exacerbating the shortfall in MST graduates, but it limits their options, creating barriers for them in the future. Clearly it also limits company's options in Europe and hence Europe's options.

Graph 2



Diagnosis : There is a problem

Europe has experienced increases in the absolute number of graduates from MST tertiary education from 1998-2006. However, negative demographic trends, a stabilisation in access to tertiary education and drops in the proportion of students choosing MST, is likely to have very negative impact on absolute numbers in the years to come. At the same time, demand is likely to increase, creating a workforce deficit. Negative attitudes to education and work in science and technology amongst young Europeans further support this conclusion.

So – yes there is a problem. However, due to the lack of better workforce demand forecasts, it is not possible to say how big the problem is.

Remediation : What can be done about it ?

Business (and Engineering Associations) can play a role. Three key areas can be identified where business can help increasing interest in MST education and careers. Business can work together with schools to provide:

- Meaningful life and career contexts to school MST classes
- Role models for students
- Information on MST careers for students, teachers and careers advisors

Although some partnerships exist at the university level, business is not used to getting involved in primary and secondary education establishments. And whilst senior management is often involved there is a lack of middle management interest. The presence of business in education is considered by some with suspicion, and in some cultures is even rejected.

It is the responsibility of the collective leadership in society to ensure that its most precious resource, TALENT, is directed towards addressing its most pressing challenges.

Engage with Teachers

Business can contribute to enhancing the role of teachers by providing training on MST topics, resources and contexts, helping provide pupils with access to role models and career prospect information, and enabling teachers to 'tell the story' of the role MST skills play in the world. This does not mean business taking on the role of teaching the teacher, but providing access to the contextual knowledge of MST and the opportunities these subjects open up.

Address All Stakeholders

It is imperative to address all stakeholders in this arena. Creating meeting places, both physical and virtual, that can be replicated at different levels (local, national and European), creating a complete concept that drives best practice.

Measurement

It will be important to create new instruments to analyse labour market requirements in order to be able to train and prepare people with the right skill sets for when new jobs come on stream. More studies should be conducted on how young people make choices and what those choices are based on.

*Unless Europe can reverse the downward trend in MST studies, based on **WHAT** can we have an expectation that there will be a sustainable and innovative future for Europe and a relevant position in the world ?*

Build on Existing Best Practice

A large number of projects and initiatives targeting an increased interest in MST education and careers exist throughout Europe. A number of promising initiatives exist, including Jet-Net (the Netherlands), Wissensfabrik (Germany), C.Génial (France), Science Team K (Denmark), Næringsliv i skolen (Norway) and MATENA (Sweden). However, most are relatively small scale, reaching out only to local youth, and largely depend on the commitment of individuals or small groups of enthusiasts.

Despite common objectives, projects and initiatives are not learning from and communicating with each other. This has been identified as critical by a growing body of research and a number of policymakers.
OECD (2008c) stated, *"A network of stakeholders (linking educational resource centres, the business community, science and technology education specialists, and student and teacher communities), should be established to share information on best practises between countries and the various communities involved."*
The European Commission's High Level Expert Group on Science Education Renewal has made the points that *"Teachers are key players… being part of a network allowing them to improve the quality of their teaching and support their motivation"* and that *"The articulation between national activities and those funded at the European level must be improved"*. A report by the National Centre for Mathematics Education in Sweden argues the need for Europe to *"support and coordinate all the positive forces promoting better mathematics learning and teaching".*

In terms of business-education partnerships, measures need to be defined; best practice identified and rolled out across Europe. ERT has suggested that a European Coordinating Body should be created to act as an umbrella and coordination centre.

Companies are supporting existing schemes and believe that support should be given to expand them to all European countries at a quicker speed than is currently occurring and encouraging effective legislation to support this.

Best practice can also lead to identifying common success factors for business-education partnership schemes, such as customisation, programmes tailor made to fit local circumstances; targeting of a very young audience (four year old and above); sustained efforts that continue over a substantial period. They involve the personal commitment of the involved companies' CEOs; and they use a networked approach across regions.

In Conclusion

In most European Member States, interest in technological studies is in decline. Resource eco-efficiency is one of the areas where significant progress needs to be made, not only for Europe's benefit, but in order to accommodate the economic development ambitions of developing countries.
This is a challenge and an opportunity. Eco-innovations can create new green jobs and be a source of European competitiveness. To succeed, society must pay more attention to communication and education and ensure that its most precious resource – Talent – is directed towards finding solutions for society's most pressing problems: *resource demand growth* and *climate change*.
For Europe, MST plays a crucial role in growing research and innovation capacity to ensure a sustainable future in a world of increasing eco-competition. Europe needs more technology from highly skilled people who can push the frontiers of technology and the boundaries of sustainable progress. ❑

Best Practice Example : JET-NET (Youth & Technology Network)

A Public Private Partnership between the Ministry of Education, Ministry of Economic Affairs and 30 large companies including non-Dutch companies, started in 2000. Several hundreds of enthousiastic emloyees of these companies are involved in activities for almost 150 schools in the Netherlands (almost 30% of the total). These activities comprise guest lessons, workshops, practical activities, games, school and career advise sessions, teacher workshops, and larger national events (like the Jet-Net Career Days for 2500 children). Philosophy of Jet-Net is that the activities need to comprise elements relating to the societal relevance of MST and to the career perspectives. Objective is to get more students to choose MST studies and thus curb back the double downward trend in demographics (fewer young people) and even steeper decline in science faculty enrollment.

Schools collaborate with one particular company, but the network also allows other types of collaboration (e.g. the involvement of a large network of engineers). A number of evaluations and audits made clear that schools are very happy with this type of collaboration. Shell collaborates with 30 schools spread out over the Netherlands.

After 5 years of activities organised by Jet-Net companies, a positive change in the number of enrollments in MST at the universities could be observed in the Netherlands which continued over the last 2-3 years.

INITIATIVES

Jet-Net (Netherlands)
Jet-Net is a Dutch national platform for school and business collaboration created jointly by the Dutch government, schools and businesses in the Netherlands. The platform supports and stimulates the development of cooperation programmes between individual schools and companies.
www.jet-net.nl

Wissensfabrik (Germany)
Wissensfabrik is a German umbrella organisation encompassing projects and initiatives aimed at improving education (mainly maths, science and technology) and entrepreneurship. Many projects are about providing locally adapted tools that assist teachers in reaching the targets set up by the curriculum.
www.wissensfabrik-deutschland.de

C.Génial (France)
C.Génial is a French foundation established by Areva, EADS, France Telecom, Schlumberger, Technip and SNCF.
www.cgenial.org

Science Team K (Denmark)
Science Team K was a Danish collaborative effort in the years 2003-2007 between schools, businesses, and local government in the Danish Municipality of Kalundborg incorporating training of teachers, networking between institutions and support to new education equipment.
www.scienceteam.dk/

Næringsliv I skolen (Norway)
Næringsliv i skolen is a Norwegian programme providing guest lessons, company visits, thematic projects, mentorships and shadowing days in formalised, legally binding, partnerships between schools and businesses. Activities are based on curriculum requirements and needs expressed by teachers. The formal agreements support long term commitment and continuity.
www.nhoung.no/nis/

What can National Engineering Associations do to ensure a healthy MST talents pipeline in their country?

They can help by:

- Becoming aware of the situation and trends in their own country, based on the country analysis in the ERT and INSEAD Reports.
- Building 'Coalitions of the willing' to address the challenge working along with Universities, businesses and politicians.
- Engaging with media to proactively portray the critical role of MST talent to address today's world challenges (such as fighting climate change).
- Alerting their governments, notably the Ministry of Education and Ministry of Economy about the situation in their own country
- Engaging with primary and secondary schools to address the role model issue and to find ways to communicate to the youth how MST can be very useful competencies to achieve the ideals they hold dear.
- Placing MST education at the core of government post-crisis strategies towards more sustainable models of economic growth (as well as in the EU 2020 strategy).
- Looking at existing best practice platforms (notably **www.jet-net.nl/english** and **www.wissensfabrik.de**) and study which elements would work best in their national educational system. ❑

The big question is whether Europe will have the ability to play a leading role in the transition towards a more sustainable world economy with new green products, green industries and green jobs, or whether the Chinese and Indians win this eco-competition. Or indeed the US who have said that as part of their Economic Recovery Package they will pump billions of dollars into education, notably Mathematics, Science and Technology. In other words they are filling their Talent Pipeline. What will Europe do ?

- INSEAD report (March 2009): «Providing the skills for an Innovative and Sustainable Europe» **www.insead.edu/discover_insead/docs/WhocaresWhodares.pdf**

- ERT report (Oct 2009): «Mathematics, Science & Technology Education Report - The Case for a European Coordinating Body» **www.ert.eu/DOC/09113.pdf**

© Photo: Triptyque / JJ De Neyer

Hans van der Loo engaging with EU Commission Vice President Guenther Verheugen at the launch of the INSEAD Report

Hans van der Loo is Head European Union Liaison at Royal Dutch Shell. He is also sherpa to Shell's CEO in the ERT. He is active in promotion of the importance of MST Talent in Brussels, which he sees as crucially important as source of solutions required for the Energy and Climate change challenges which are the most important dossiers he works on.

Shell is renowned for it forward looking scenarios. Understanding 'lead time' constraints as well as pipelines, they have been particularly engaged in the European Talent Pipeline :

- They were founding member of **Jet-Net**.
- Since 1984 they have organize the **Shell Eco-marathon** which every year brings together some 3000 students from all over Europe to push the boundaries of sustainable mobility.
- Former Shell CEO, **Jeroen van der Veer,** who stepped down in July 2009, became Chairman of Platform Betatechniek, which initiates programmes to promotes MST education. Jet-Net is one of their programmes.
- Former Shell Global Solutions director **Gérard de Nazelle** has become Director of the European Institute of Technology in November 2009. ❑

All illustrations were made available by Jet-Net.

THE U-MULTIRANK PROJECT

Designing and Testing the Feasibility of a Multi-Dimensional Global University Ranking

Author:
Gero Federkeil, CHE – Centre for Higher Education Development

Following the discussions about methodological flaws of existing international rankings and the need for transparency about the emerging European higher education area, the European Commission launched a call for tender to develop a new, multi-dimensional global university ranking. The tender was won by the CHERPA network, a consortium of CHE (Centre for Higher Education Development, Germany), CHEPS (Center for Higher Education Policy Studies, University Twente, the Netherlands), CWTS (Center for Science and Technology Studies, Leiden University, the Netherlands), the research group INCENTIM at the Catholic University Leuven (Belgium) and OST (Observatoire de Science et Technique, Paris).

Whereas the existing global rankings, in particular the Shanghai Jiaotong ranking and the QS/Times Higher Education Supplement Ranking, focus – by the choice of their methodology and their indicators - on one type of higher education policy only: the large, comprehensive internationally-oriented research university. This leads to a narrow concept of academic excellence as excellence in research only. Institutions that have different missions, aims and ambitions have no chance to gain international visibility in those rankings. Those rankings induced an international race for reputation based on research that risks to decrease in diversity. In contrast to that, U-Multirank is going to develop a concept for both institutional and field-based rankings which allows to make visible different kinds of academic excellence: excellence in teaching, knowledge transfer and innovation, internationalization and regional community outreach. Therefore the ranking will include not only universities but also non-university higher education institutions, like e.g. the German Fachhochschulen and the Dutch Hogeschoolen. In order to compare only comparable institutions in terms of their mission, structures and programmes, the rankings will be based on a pre-selection of institutions based on the idea of a classification of higher education institutions (U-Map project).

Gero Federkeil

U-Multirank will develop a concept and make a feasibility study both for institutional rankings of whole institutions and for field-based rankings. Here the pilot fields will be business and (Mechanical and Electrical) engineering. **The field-based feasibility studies are supported by FEANI and EFMD (for business).**

Currently the project is designing the concept and the set of indicators to be tested in the feasibility study which will start in 2010. Results of the project will be available in spring 2011. The concept includes five dimensions of performance of higher education institutions:

- **teaching & learning,**
- **research,**
- **knowledge transfer,**
- **internationalization and regional engagement.**

Indicators will cover the process of "production" from some information on input and processes that are relevant for performance/quality to output/outcome.

The ranking will apply some basic characteristics of CHE rankings: first, it will sort institutions into groups instead of producing a league table and, second, it will be multi-dimensional, i.e. each indicator will stand for itself and indicators will not be aggregated into one composite overall score. This allows a user-driven approach as there is no fixed definition of the relevance of individual indicators. After a first consultation on indicators FEANI (and EFMD "European Foundation for Management Development") will be included in the process of selecting pilot institutions for the feasibility study, too. ❑

For more information see: **www.u-multirank.eu**
or contact Gero Federkeil (gero.federkeil@che-ranking.de)
or Frans Kaiser (f.kaiser@utwente.nl)

PROFESSIONAL CARD FOR ENGINEERS

Author:
Philippe Wauters, Secretary General of FEANI

At the past General Assembly of FEANI in Den Haag in October 2009, the VDI (Verein Deutscher Ingenieure) informed the participants about their decision to implement a professional card for engineers in Germany. At that meeting, VDI invited other FEANI National Members interested in setting up a professional card to join VDI and participate in the project.
In the meantime, it is confirmed that National Members from Switzerland, The Netherlands and Austria will participate.

It was indeed considered that it would be easier to set up professional cards for engineers at National level first rather than immediately at European level but to keep the latter objective in mind during this first implementation.

A participation of other FEANI members in the project would be a guarantee for a smooth integration of the professional cards when the time will have come for such a project.

It is planned that the card will be awarded following an application to those having successfully finished a Bachelor or a Master degree in a recognized German Higher Education Institute. A commission to check and confirm the validity of the applications will be installed.

A kick-off of the project is planned on 4 February 2010 in Düsseldorf. ❑

ENAEE INITIATIVE TO PROMOTE THE EUR-ACE® LABEL

Author:
Jana Möhren


Jana Möhren

The European Network for the Accreditation of Engineering Education (ENAEE) has been active for almost four years. It has been able to bring together the main actors in engineering education in Europe and draw continuous interest from engineering societies, quality assurance agencies and higher education institutions worldwide.

One of the main achievements in those past years has been the development of the standards and criteria for the EUR-ACE® (European-Accredited Engineering) label. This European quality label has been awarded to more than 400 First and Second Cycle programmes by the authorized agencies within only two years.

The General Assembly of ENAEE has now decided to launch a new initiative to promote the EUR-ACE® label within the EHEA. The main aim of this new project is to raise awareness of ENAEE and the EUR-ACE® system among the relevant stakeholders. It is intended to increase the number of authorized agencies and subsequently the number of awarded labels.

One of the first steps of the initiative will be developing new information material for students, parents, higher education institutions, engineering societies, companies, quality assurance agencies and others about the intentions and advantages of the EUR-ACE® system. The new material shall also provide a modernized and uniform design of ENAEE and EUR-ACE®.
The initiative will start in January 2010 and is laid out for a full year.
It will be managed by Ms. Jana Möhren. She is currently the secretary for the EUR-ACE® Label Committee and a programme manager at ASIIN, Germany, where she is also responsible for several European projects. ❑

ANNUAL BUSINESS MEETINGS 2010 in DEN HAAG

Author:
Ph. Wauters / R. Heissner

From 30 September-2 October 2009, FEANI held its Annual Business meetings (ABMs) in Den Haag (The Netherlands). This annual event included the General Assembly, a Workshop and an excursion to the Technical University of Delft as well as internal Committee and Board meetings.

On 2 October at the premises of SHELL, the President Lars Bytoft welcomed for the General Assembly all National Members (NMs) of FEANI, except the ones from Cyprus, Luxembourg and Serbia. Several guests were also present, including representatives from the membership candidate country Croatia, from SEFI (European Society for Engineering Education), EYE (European Young Engineers), and ENAEE (European Network for Accreditation of Engineering Education). The FEANI President also greeted representatives from the WEC 2011 (World Engineers Convention) as well as the Honorary President of the Kuwait Society of Engineers, who is the new President Elect of WFEO (World Federation of Engineering Organisations).

FEANI Membership

The General Assembly unanimously approved the application from HIS – The Croatian Engineering Organisation - as new FEANI National Member as of 1 January 2010. This brings the membership of FEANI to a record number of 31 countries.

FEANI Board

Contrary to the past year, where many new faces including the new President joined the FEANI Board, this year there was only one vacancy in the Board to be filled. The delegates confirmed by large majority Mr. Daniel Ameline from France as new Board member for a first 3-year term.

Activities at FEANI

A Strategic Workshop was held by the Executive Board in January 2009 to set up directions and responsibilities for the next three years to come. The Strategic Plan includes five focus areas and several activities with Board member responsibilities. In line with this, the Board members and the Secretary General reported to the General Assembly about the activities in the past months.

The Secretary General, Philippe Wauters, reported about the focus area 'Education and Professional Development', including EUR-ACE with the new EU-funded EUR-ACE SPREAD project to promote this accreditation system of

FEANI National Members at the General Assembly at the premises of Shell

Lars Bytoft, FEANI President

engineering study programmes in Italy, Lithuania, Romania and Switzerland.

He also reported about the new EU-funded University Ranking project, where FEANI is a member of the consortium led by CHEPS/Twente University in the Netherlands and the German Center for Higher Education Development CHE.

Mr. Wauters also highlighted a new project 'More Engineers for Europe' that FEANI has started in conjunction with its German member VDI (Verein Deutscher Ingenieure) for setting up a European campaign to attract young people to SET (Sciences, Engineering and Technology).

The Board member Jim Birch informed the General Assembly about activities related to the focus areas 'Mobility' as well as 'Professional Standards and Ethics', in particular about activities of the Working Group on 'professional card' and the follow up of the Code of Conduct position paper approved by the FEANI General Assembly in 2006.

Much interest was generated by the presentation of the Board member Rafael Aller on the focus area 'Societal Engineering issues', and the General Assembly supported to intensify efforts for this subject.

Under the focus area 'European engineering culture in global fora', the Honorary President of the Kuwait Society of Engineers/President Elect of WFEO, Adel Al Kharafi,

FEANI Members

presented the Alternative Energy congress in Kuwait in November 2009 in conjunction with the WFEO annual meetings.

The subject of energy will also be the guiding line for the WEC 2011 event in Geneva/Switzerland entitled 'Engineers power the world', which was presented by Ruedi Noser and Hannes Treier from the WEC 2011 organising team.

Finally, the Chair of the Continuing Professional Development Committee (CPDC), Sari Taukojärvi, and the Chair of the European Monitoring Committee (EMC), Jan Willem Proper, gave reports about past year activities.

FEANI Executive Board

Superbus/faculty of aerospace engineering TU Delft

More information about FEANI projects and activities can be found on the FEANI website **www.feani.org**.

Author: Bouke Bosgraaf

FEANI Workshop and Excursion

The Workshop was organized in the morning of 1 October by the hosting National Member on the subject 'FEANI in the future'. The goal was to formulate members' wishes regarding the activities of FEANI in the future. Beforehand a questionnaire about this topic was sent out to all FEANI National Members.

The President, Lars Bytoft, started the meeting by saying that he is glad to have a discussion about opportunities for FEANI. He stated that more progress should be done within FEANI in the coming years in order to keep our position within the EU; there is a lot of work to do and this work can only be done by active contribution from the National Members. Afterwards, Bouke Bosgraaf from the Dutch National Member KIVI NIRIA, presented a summary of the results of this questionnaire and gave the floor to the moderator, Karel Lyben, Dean of the Faculty of Applied Science at Delft University of Technology.

As a result from the questionnaire, Karel Luyben proposed three statements for a debate. The first statement concerns the role of FEANI as a platform. ***Should it be a lobby platform or rather a knowledge exchange platform?*** Many countries replied that they need FEANI for a strong voice in Europe. The EU institutions are only listening to European organizations. It was also underlined that FEANI can only lobby from a knowledge position, so the need to have both platform functions. The moderator pointed out that there are active and passive lobbyists - whereby "passive" is defined as the EU comes to you for your opinion. FEANI is having some difficulties with lobbying, because there is not always a common opinion. It was agreed not to always wait for common sense and that FEANI must create space for pilots if some countries have good energy for it. The other statements: ***European labor and education market will eventually be one*** *and* ***Promote participation of engineers in the social debate*** took less time but not because they were easy statements to discuss. Especially for the last one, it is difficult to formulate the contribution by FEANI and the difference with the national activities.

At the end, the FEANI President Lars Bytoft concluded that most National Members wanted FEANI to have a strong voice for engineers emphasizing their role for the community, and that education, mobility and innovation topics should lead towards policy papers and activities/ projects. To achieve this, FEANI should be proactive in taking forward challenging issues and start with projects/ experiments. Results of the pilots can then be brought back to the GA for endorsement. He thanked Karel Luyben for his excellent contribution and the National Members for their active participation in the debate. He ended the Workshop with the words: "Lets go forward".

In the afternoon, the hosting National Member organised an excursion to the Faculty of Aerospace Engineering at Delft University of Technology instead of a traditional Academic Session. After a warm welcome by Mr. Van den Berg, the Chairman of the university, different laboratories were visited. The excursion ended with by a lecture of Professor Patricia Osseweijer about the important role of science communication. This interesting site visit was much appreciated by all participating delegates. ❑

Outlook

The next FEANI ABMs will take place from 29 September to 1 October 2010 in Sofia/Bulgaria. For 2011, FEANI has received an invitation from the Swiss National Member to hold the ABMs in connection with the WEC 2011 in Geneva.

ENGINEERS POWER THE WORLD

World Engineers' Convention (WEC) 2011 in Geneva 5-7 September 2011

Author:
Ph. Wauters / R. Heissner

"The big global challenges are known; energy is one of the most important. Engineers play a key role in providing solutions for the future and making the sustainable use of energy a reality".

Main topics of the event, all addressing to the global energy challenge, will be:

- **Global Challenges**
- **Education**
- **Mobility and Transport**
- **Urban development and buildings**
- **Centralized and decentralized energy conversion, transport and delivery**
- **Renewable energy and storage**
- **Rational end use & large consumers**

The objective of the Convention is to present contributions proposing practical solutions based on today technologies which can be implemented immediately. Contributions/ papers are expected in line with this goal.

The Secretary General of FEANI is part of the Program Committee and of the International Advisory Board preparing the event hosted by the Swiss Society of Engineers and Architects SIA. FEANI will actively participate in the program, more particularly focused on its project 'More Engineers for Europe' aiming at attracting young people to engineering and scientific studies and a career in engineering.

WEC 2011 will be the final event out of three starting with the Energy congress in Kuwait in November 2009 and the one planned for October 2010 in Argentina aiming at a clear final resolution on the 'energy' topic at the end of this meeting in Geneva.

WFEO meetings as well as the FEANI Annual Business meetings, including the General Assembly, will take place in conjunction with WEC 2011 in Geneva. ❑

More information:
www.wec2011.org,
www.feani.org, section 'events'

World Engineers' Convention 2011 in Geneva

FACING THE GLOBAL ENERGY CHALLENGE

Author:
Stefan Arquint, Secretary General, Swiss Engineering STV, Switzerland

Stefan Arquint

From 5 to 7 September 2011 Geneva will be synonymous with sustainable energy. Engineers, politicians and major business figures from around the world will gather at the World Engineers' Convention 2011 (WEC 2011) for detailed discussion.

Sustainable energy – the provision of energy to meet present needs without compromising those of future generations – is one of the greatest challenges of the 21st Century. Of prime concern to engineers, politicians, businesses and individual citizen alike, it is generating numerous events and a wealth of literature. The key questions are whether we have enough energy for the world's population, sustainable means of covering demand and sufficient qualified engineers to meet these challenges. Answers can only be found through global collaboration between engineers, politicians and the world of trade and industry. The World Engineers' Convention (WEC) 2011 in Geneva provides a platform for this international meeting of minds. The title *Engineers Power the World – Facing the Global Energy Challenge* reflects its

Source: Geneva Tourism
From 5 to 7 September 2011 Geneva will host the World Engineers' Convention 2011 (WEC 2011)

focus on the sustainable energy imperative. Following on from Hanover, Shanghai and Brasilia, this will be the fourth such event.

Addressing the Burning Energy Issues through Innovation

"Everyone interested in outstanding solutions to energy efficiency and renewable energy issues will draw inspiration from each day of our next convention in Geneva. We seek to encourage innovative engineering for globally sustainable use of energy", explained WEC 2011 Programme Committee Chair Professor Daniel Favrat of the École Polytechnique Lausanne during the WEC 2008 closing ceremony in Brasilia. "WEC 2011 isn't just for engineers, it's also for representatives of business, government and education".

Seven Key Topics

The three-day convention will cover seven main concerns. One notable example is the global challenges posed by strong demographic growth coupled with the legitimate desire for development. These place great stresses on our global environment and resources. In Geneva, representatives will share views on how science and engineering can help assist political change overcome these difficulties in promoting fair and equitable development. Another challenging issue is mobility and transport. These have long been key determinants of progress and the sense of freedom so many of us enjoy. Soon to be the largest consumer of energy in a growing number of countries, transportation is placing a burden on environment and infrastructure needs. The fast pace of growth of energy-intensive road, rail and transport in particular demands major innovations in ecoefficiency. Under *Urban development and buildings*, participants will therefore also discuss our basic need for a comfortable standard of living. The ongoing urbanising growth in world population is turning cities into major energy and resource consumers. However, these conurbations also present opportunities for synergies and more efficient use of resources. The main thrust towards more sustainable engineering is evident in land use planning, building technology and management, advanced energy distribution networks and systemic analyses based on a full life cycle approach.
WEC 2011 will also be concerned with education, centralised and decentralised energy conversion, passenger and goods transportation, renewable energy & storage, rational end use and major consumers.

Recognising Engineering Excellence

Last, but not least, one special forum of the convention will be devoted to young engineers and a consideration of the issue of gender.
WEC 2011 will particularly address the most innovative and dedicated representatives of the engineering profession from around the world; from private consultancies through governmental organisations to NGOs. Delegations from the major engineering societies and leading academics from the world's universities will also be lending their weight.
The WEC is sponsored by the international organisations UNESCO and FEANI, and by the World Federation of Engineering Organizations (WFEO), which represents a total of 15 million engineers from 90 nations.
WEC 2011 is organised by the Swiss engineering and architectural associations Swiss Engineering STV, SIA, Electrosuisse and FTAL, with the support of the Swiss Academy of Engineering Sciences (SATW), the Swiss Federation, the ETH and the EPFL, the University of Applied Sciences of Western Switzerland, the city of Geneva and many other partners

World Engineers' Convention (WEC) 2011

Engineers Power the World – Facing the Global Energy Challenge
5 to 7 September 2011
International Conference Centre, Geneva, Switzerland
www.wec2011.org ❑

source: Geneva Tourism
The International Conference Center in Geneva

WFEO GENERAL ASSEMBLY, EXECUTIVE COUNCIL and COMMITTEES met in KUWAIT

Author:
Ph. Wauters / R. Heissner

The General Assembly and other meetings of the World Federation of Engineering Organisations (WFEO) took place in Kuwait the first week of November 2009. The Kuwait Society of Engineers (KSE) hosted the meetings and organized in conjunction with the WFEO meetings an Engineering Congress entitled 'Alternative Energy Applications: Option or Necessity?'

Several events had prepared the General Assembly during the first days of the week:

- The eight Standing Committees reviewed their activities during the current year and discussed their programmes for the next year.
- The Executive Council received their reports as well as those of the Task Forces and International Members and prepared the recommendations for the General Assembly.

72 members in good standing attended the WFEO General Assembly on 5 and 6 November, in addition to several other countries that participated as observers.

The delegates took note of the signature of the Framework Agreement between WFEO and UNESCO and highlighted the cooperation between WFEO and the UN agencies.

They approved the creation of a Standing Committee on Disaster Risk Management hosted by Japan. They also acknowledged the award of WFEO Medals of Excellence and other awards.

Furthermore, it approved a so-called Kuwait Declaration related to Energy.

Mr. Wauters, FEANI Secretary General, receiving a crystal samovar from Mr. Adel Al Kharafi during the Energy Congress

Elections - New WFEO President from Spain

At the end of the General Assembly, President Mr. Barry Grear, handed over to Mrs. Maria Jesus Prieto Laffargue from Spain who will now chair WFEO for the next three years.

The General Assembly voted for Mr. Adel Al Kharafi from Kuwait as President Elect for the period 2011-2013.

Furthermore, a new Treasurer has been elected, Mr. Jaime Santamaria Serrano from Columbia as well as a new Vice President, Mr. Konstantinos Alexopoulos from Greece, former President and now Honorary President of FEANI.

FEANI is a founding member of WFEO and is represented in the Executive Council by its President. This year, the FEANI Secretary General represented FEANI in the WFEO meetings.

Next WFEO meetings:

- Executive Council meeting in Barcelona, Spain, on 1-2 March 2010
- World Engineers' Week (WEW) in Buenos Aires, Argentina, 17-20 October 2010
- World Engineers' Convention (WEC) 2011 in Geneva, Switzerland, 5-7 September 2011

More information: **www.wfeo.org**

Mrs. Maria Jesus Prieto Laffargue, President of WFEO, Mr. Wauters FEANI Secretary General and Barry Grear, past WFEO President

Alternative Energy Applications: Option or Necessity?

The Kuwait Society of Engineers (KSE) had organised in conjunction with the WFEO meetings from 2 to 6 November a number of other events, including several ones for students and young engineers as well as a major technical congress on Energy.

The Energy congress was inaugurated by his H. H. the Amir Shaikh Sabah-Al-Ahmed Al-Jaber Al-Sabah. Sessions included presentations and discussions about important subjects such as renewable energies, sustainable technologies, nuclear energy, climate change, etc.
In addition to its technical orientation, environmental and social issues such as food-energy-water interdependence, poverty and population increase, moral/ethical aspects/values and finally the need for finding integrated solutions together with politicians were also emphasized. ❑

MENTORSHIP
A CORNERSTONE IN CPD

Claes trolle

Author:
Claes Trolle, former CPDC Chairman, consultant at Saab Aeronautics

Mentorship – A cornerstone in CPD, or at least it should be if more people realize the built-in power of mentorship. Mentorship could be traced back to ancient Greece. Before Odyssey set out for his famous travels, he asked his trusted friend Mentor to take care of and bring up his son while he was away from home. This simple explanation and background describes in a nutshell what mentorship is about: To use the expertise of a trusted, senior person to train the younger generation – not in the form of traditional training but in the form of a trustful person to person relation basis.

While we are defining the parameters and players of the mentorship relation let us discuss the receiving party. In some languages he/she (let's call the person "he" as it is shorter than "she") is called "adept", which by definition of the word itself is not correct: "Adept" is defined as an expert (Oxford Advanced Learners Dictionary) – and the person who is at the receiving end is definitely not en expert (yet). A Swedish encyclopedia explains that an "adept" was originally someone who had achieved something, but later the word had changed its meaning and nowadays "adept" is a pupil who is studying some difficult subjects – or is a member of and initiated into the rites of a secret order or knowledgeable in difficult subjects. An Irishman told me that in Ireland they prefer to use the word "mentee" which I find fairly adequate – so I will use that word. Mentor and Mentee. Makes sense.

The findings and comments presented below are based upon interviews with representatives of Swedish industry Saab, Ericsson and ABB. The following aspects of mentorship have been discussed:

- Why mentorship? Goals and definition of goals
- To what extent is there an organised mentorship process?
- How are mentors and mentees selected?
- To what extent are external mentors used?
- Are there a plan and an agenda for the activities? If so, who is behind this plan: Corporate or individual mentor-mentee?
- How are the activities financed?
- Does the plan contain a compulsory part? If yes, for how long?
- Is it common for the mentor and mentee to continue their co-operation after the end of the official plan?
- Are there any significant differences between female, male and mixed mentorship?
- What has been achieved and what is the usefulness of the mentorship programs?
- Why does industry continue and – if applicable – why does industry not increase the mentorship activities?
- Any international aspects from multinational companies.

But what is mentorship?

Mentorship is the collective name of target-oriented interaction between mentor and mentee intended to increase the competence of the mentee by means of external or internal human resources. The final result is achieved by means of mutual trust and confidence. Prerequisites encompass commitment, equality between the persons involved, mutual openness and personal involvement. But the mentorship process does not include organized training, courses (with the exception of the introductory course to set the rules for the mentor programme straight), lectures, exams or similar formal training or learning activities. The latter formal and organized activities may well be part of the personal competence development plan, but should be separated from the mentorship process.

When should mentorship be considered an option?

Mentorship could be:

- A natural development of personnel in a learning organization
- Part of the leadership training (further development of managers or managers-to-be)
- A way to prepare for shift in generations (any level)
- A method to transfer knowledge and experience between persons
- A way to improve the conditions before replacing managers

Mentorship is a cost-effective way to pave the way for changes, involving managers as well as specialists - and "common people" - as it is built on individual choice and consent. The mentorship process must never be felt as a burden for any of the parties involved but an opportunity to improve in one's role: This goes for the mentor as well as the mentee.

To design and produce a world class Airborne Early Warning and Command (AEW&C) aircraft requires years of experience. Dedicated mentorship where competence, ingenuity and craftsmanship are transferred to the next generation of engineers is a prerequisite to accomplish a task few enterprises in the world can achieve.

How does mentorship work?

How does it start? There are three fundamentally different ways but the reasons are very similar:

- **A corporate decision** (such as the multinational corporation ABB - Asea Brown Bovery in the late 90's) that all personnel – not only staff – should participate in a mentorship programme. One reason was to increase awareness and another to get the employees more involved and perhaps also to eliminate invisible borders. In addition to increase competence – which is perhaps the most important part from a managerial point of view. Another corporate decision (from Saab AB, provider of defence and security systems) is to increase the number of female managers. To achieve this goal, mentorship programmes for female potential managers is considered to be a useful tool.
- **Individual requests.** In many – albeit not most – enterprises the possibility exists for an employee to ask for a mentor. The reason is primarily to learn from a more experienced person about job related matters (part of the CPD), but sometimes a mentor is useful to provide information about the unwritten rules of the company, how to avoid common pitfalls, to get gossip etc. However, we have to distinguish between a coach and a mentor: A coach or a trainer is dedicated to train the trainee, to make him advance, to increase his knowledge and to "push" him forward and upwards, whereas a mentor through a dialogue, almost on equal terms, assists his mentee. A mentor has to be accepted by the mentee and a mentee has to be accepted by the mentor (which differs from the trainer-trainee relation …). This is fundamental as mentorship is based upon mutual trust.
- **The outcome of a personal development plan** where employer and employee agree on the usefulness to start an individual mentorship programme to achieve certain long time goals – including promotion or other defined goals.

The organised mentorship

Within the higher hierarchy of an enterprise, mentorship is more common, especially when it comes to "potentials" but also female networks. This is not unique but rather more common than top to bottom mentorship programmes.
The mentorship process starts with selecting the mentor and mentee and finding out by the two parties themselves whether this constellation will work or not. Provided mutual acceptance, one or more starting-up seminars are provided by the employer. During these seminars, representatives of the HR-department and external consultants advise on how the programme works, the goal or aim of the programme, what will be required from mentors and mentees, meeting frequency, financing, reporting - and what not to do. It might be important to spell out very clearly that the mentorship programme is not the programme for private or social counselling but is restricted to work related tasks. However, it has occurred repeatedly that the mentor and mentee establish a personal friendship, lasting long after the official programme has come to an end. But again, as long as the programme is funded by the employer, the rules have to be adhered to.

How are mentors and mentees selected?

A mentor will always have to be picked on a voluntary basis. The mentor will have to accept his mentee and the mentee will have to accept the mentor.
In several cases the enterprise has a "bank" of mentors who are interested in sharing their knowledge with others, often younger persons. However, having volunteered for mentorship does not automatically entail that a mentor will ever be asked to become a mentor. The mentee can ask for a specific person to become his mentor or a mentor may be assigned to a specific mentee. In both cases it requires "two for a tango" – if any of the two does not feel for a mentorship relation it has to be stopped and a new mentor and mentee respectively have to be looked for. Company

The author with mentee Malin Carlsson discussing a suggested work break down structure.

policy on mentorship will ultimately decide whether a mentee will be allowed to enter into mentorship or not. In a critical phase of a project, for instance, it might be difficult to allow a key person to spend some time on a mentorship program, but the opposite might as well occur: To be able to run the project during a critical phase, external advice and a view from the outside might as well benefit the project.

A mentorship programme often runs for a year, sometimes less. However, starting up does take time and to get somewhere close to the goal set requires time; that is why anything less than 6 – 8 months should not be considered worth starting.

Some basic requirements on the mentor

Let us first remind that the mentor is also part of the learning process – the learning process is reciprocal. That is one reason why elderly, experienced managers enjoy acting as mentors: They learn from the younger ones and get an insight in their reasoning and thinking, which might be useful for them in *their* career.

The following list on "mentor requirements" is not exhaustive but covers some useful hints for mentors-to-be:

- He is a good listener and has patience.
- He is encouraging.
- He offers his experience and may invite the mentee into his network(s) – at least into some of them.
- He is a great support for the motivation of the mentee.
- He is the one that presents the point of view the mentee could not find anywhere else.
- He shows a positive approach towards his mentee.

External mentors – pros and cons

Policies are different between enterprises: some claim that for matters of secrecy external mentors is not an option, whereas others advocate that external mentors add experience from other areas of competence and thus contribute to valuable cross breeding. Based upon the work done during the sessions between mentor and mentee it is obvious that secrecy might play a vital role. The relationship and trust between the mentor and mentee has to be open, a prerequisite for success. Should the mentee have to omit vital information from the mentor the process will suffer and the end result will be less successful. A middle way, sometimes used by Saab, is to invite mentors from other companies belonging to the same group of enterprises, for instance the Investor investment group. In this way, secrecy is maintained and kept within the family but external experience is brought into the process.

In the contacts with an external mentor the mentee might be able to relax and openly discuss problems at work he has encountered, whereas the mentee might be more careful in selecting problems and situations he brings up with a mentor from within the organisation.

The programme layout

The initial phase encompasses matching mentors and mentees. If the mentorship programmes are centralized (as was the case with ABB) they all have a common kick-off where the rules and programme for the coming year are explained and some useful hints are provided. The kick-off should end with a common mingle.

Then it is up to each mentor/mentee to commence work by setting up goals, milestones (if there are some critical project-related actions) and a draft meeting plan. If the two have done their homework properly, they have already prepared tasks to be presented and discussed at their first meeting. Otherwise the first meeting will be used to identify these tasks and draw up a course of action.

Both parties have to take notes from the meetings and each meeting has to have an agenda. The agenda, which should be suggested by the mentee and sent to the mentor at least a week in advance, should include:

- Follow-up of the previous meeting and specific tasks to be solved ("the to-do list").
- Mentee to report from his work (progress, difficult situations, success stories).
- Mentor to respond and advise on this report.
- New list of tasks to be completed until the next meeting ("who does what").
- Summing up of today's meeting.
- Next meeting (unless decided upon already).
- Last meeting only
  (outline of report to the Management, HR).

When the programme is finished it is important to decide what to do with the minutes as they are confidential.

Financing

There are at least two opinions as to when the meetings should take place, during normal working hours or outside working hours.
If the meetings and at least some of the preparatory work is done within normal office hours, it's easy to authorize work within the programme to be covered by the normal "personal development" budget. If external mentors are used there has to be an agreement between the mentor and the HR department about the budget.
If, however, meetings and activities take place mainly outside office hours, there has to be an agreement between the mentee and his manager on how to cover the extra costs for the extra hours. If there is a company policy on mentorship programmes, this matter should be already solved, but otherwise there has to be a generous attitude to this kind of activity as it is beneficial to the company too – not only to the mentor or mentee.
Extra costs related to the programme should be covered to a reasonable amount: The programme is a mutual investment; otherwise it should not take place.

Male vs Female – mixed sexes

Although there seems to be a higher proportion of male mentors for male mentees and female mentors for female mentees, our society should have achieved a level awareness where we realize we have a lot to learn from the other sex. A manager is often responsible for male as well as female employees – hence the usefulness to get a better knowledge and thus make better use of the employees. This is considered to be even more important for female managers as they are less common than males as managers in most companies. Saab is running a mentor programme for female potentials and managers to make them more prepared to take responsibility for a mixed workforce. The mentors in that programme are also mixed – males as well as females.

What has been achieved by mentoring? Is it worth the resources invested in it?

This is really difficult to answer properly. But if we turn it the other way and ask: Why do so many enterprises spend time and money on mentoring programs? Not only companies but also other institutions – even high schools where the pupils act as mentees.
Most likely it is considered worth the resources spent. But then, why do so many companies limit the mentor programmes to the management only?
One answer is: In general, too little resources are spent on CPD (Continuing Professional Development). A study done by the FEANI CPD Committee in 2000/2001 encompassing more than 100 enterprises around Europe, revealed that far less than 50 % of the enterprises take active measures to enhance CPD. On-the-job training is by many the most common CPD. In SME's on the other hand, the few engineers employed are key persons and cannot be allowed to use their time for anything else than production.
After all, mentor programmes are most useful for transfer of knowledge and experience, but they suffer from the same mentality as other CPD activities: *"Yes, they are useful but take time and resources. We do have the financial resources, but we do not have the time. Work has priority."*
This is not a statement by any of the enterprises, but my sad experience from many years in industry. ❑

ENGINEERS IRELAND

Aidan Harney,

ESSENTIAL ASPECTS of MENTORING TRAINING

Author:
Aidan Harney, Manager of the Engineers Ireland CPD Accredited Employer scheme

In 2008 Engineers Ireland developed a new 'Mentoring for Professional Development' one-day learning programme. In 2009, the course won a national training award from the Irish Institute of Training & Development (IITD) as a 'Best Practice Initiative'. Here the course author and programme facilitator Aidan Harney writes about how others can improve training for mentors.

My dilemma in developing a new mentoring 'offering' was that mentoring is notoriously hard to define. Universal agreement on the functions and desired outcomes of mentoring is lacking. How can you train engineers to get better at an intervention that is couched in such 'fuzzy' conceptualisation?

From studying the 'CPD' dossiers Engineers Ireland had amassed by 2008 on 100 of Ireland's leading employers of engineering professionals, it became clear that the traditional U.S. model of mentoring as a form of sponsorship and protection aimed at promoting exposure and visibility was truly defunct. Contemporary mentoring has instead two core functions: knowledge exchange and professional development. If this is the case, mentors need to understand how knowledge is exchanged and how adults learn. I took these principles as my foundation stones for the development of a new mentoring course. My own experience of attending various mentoring training programmes over the years also tainted my approach. Inevitably, I found the training focused on the core competencies needed to be a mentor yet an integrated and applicable process, or tool, was always lacking. I feel strongly that most people have an intuitive sense of what skills are required to mentor. Certainly, the literature on mentoring is clear. To be an effective mentor, certain skills, largely communication skills, are required of the mentor (and the mentee). The mentor needs to be an adroit listener first and foremost and have the abilities to question, challenge and offer feedback and support. There needs to be trust. The ability to tell stories is crucial. For mentees, it allows them express what's going on and helps sets a developmental agenda. For the mentor, story-telling allows tacit knowledge and experience to be conveyed in a rich and textured way.

We know all this and yet why is mentoring so difficult to get right? The literature also shows that the biggest downfall of mentoring is that mentor and mentee don't meet. They just don't get together. Why? It's simple. They know *why* they should meet and they know *what* skills will be required. What is lacking is the *how* part. Educating mentors to use a simple process-tool is the key to effective mentoring training. Without it, with training focused solely on the functions and competences of mentoring, there may be some learning but it won't have much application and hence little impact.

The process of mentoring

Alred, Garvey & Smith (2006) reduce mentoring to a simple, three-stage process-form, namely:

- **Exploration**
- **New understanding**
- **Action Planning**

I train course delegates to use a 4C Model, constructed by adapting ideas from a number of books including Pegg's "The Art of Mentoring" and Egan's "The Skilled Helper." The model consists of four stages, namely:

- **Challenges** – what are the professional development goals of the learner?
- **Choices** – what options do they have? What are the consequences of each?
- **Creative Solutions** – what's the best option, based on shared experience?
- **Conclusion** – what quick wins and next steps can be agreed?

Training mentors is not easy. However, with more than 20 programmes now run for small-, medium- and large-sized organisations, both in the public and private sector, I've certainly gathered some good tips for trainers. My top three are as follows.

1) Don't worry too much about selection and matching. The time spent trying to predict who might possibly 'click' can be far more effectively spent educating mentors (and mentees) how to use a simply process that works no matter what the combination of participants.

2) Spend less time on theory and more time on role play and reflection to come up with good ground-rules. This allows you to show mentors good adult learning theory in action. Allowing them to run mentoring sessions in a safe setting is invaluable and essential.
3) Mentoring has boundaries, limitations and phases. Make sure mentors are aware that mentoring is not counselling. Make sure they recognize that it takes time to build rapport. Make sure mentors aren't afraid to acknowledge they are only human and they too will be learning as they go.

HR can be of great support in terms of facilitating new mentoring pairings and also in checking with both sides to make sure things are progressing well. HR might brief mentees on what to expect before they begin. This can greatly increase participation and success rates. And how do you rate success? Consider quantitative and qualitative evidence. Certainly the number of graduates achieving Professional Engineer or Chartered Engineer status might be indicative of success as will be the frequency and duration of mentoring meetings. However, don't forget to simply ask participants if it is working for them? Are they exchanging knowledge? Are they undergoing the desired professional development? Have they made the hoped-for transition?

Those who volunteer to act as mentors are unlikely to get much thanks for their efforts so don't forget to arrange a get-together to celebrate their contribution and achievements and get their feedback on the process too. ❑

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See: **http://www.engineersireland.ie/cpd/cpd-employer/mentoring/**

CPD COMMITTEE met at VDE TEST and CERTIFICATION INSTITUTE

Author:
Dr. Michael Schanz

The November meeting of the FEANI Committee of Continuing Professional Development (CPD) was hosted by VDE (Verband der Elektrotechnik Elektronik Informationstechnik e.V. . The meeting took place at its premises in Offenbach in Frankfurt am Main. Besides the meeting's daily business and project planning, VDE took the opportunity to give the participants a picture on its profile as a technical and scientific association.

Dr. Michael Schanz, member of the Committee since 2000, gave an overview of VDE's history to the CPD Committee. VDE covers the whole range of electrotechnology: amongst others science, education, profession, standardization, testing and certification.

After the lunch break, a part of the testing facilities was shown during a guided tour comprising one of the most modern test facilities for electromagnetic compatibility (EMC) worldwide. VDE grants its well-known certification mark to electrical products which meet e.g. standards for safety or usability. One of the pressing topics many engineering associations in Europe deal with, is the lack of Engineers. **Dr. Uwe Pfenning**, University of Stuttgart, gave an outline of newest results of research in young people's technical education, their so-called technical socialization, their attitudes towards technology and the vast number (nearly 1000 in Germany) of single projects to attract young people to technology. ❑

FEANI CPD Committee members

COMPETENCE DEVELOPMENT using **CAREER COACHING** INSIDE THE COMPANY

Author:
Mrs. Marianne Harg, President of Tekna (The Norwegian Society of Graduate Technical and Scientific Professionals)

In our company, an IT service provider, we started a major restructuring program more than 15 years ago, based on the Business Process Reengineering concept. To be able to form the flexible organisation needed for a process and role based way of working, we realized that we had to get rid of all traditional departments where people had a defined position and instead set up a new concept of one common **resource pool** for all employees. This would ensure our delivery capability and efficient and flexible utilisation of our core competence and capacity.

We developed a competence strategy based on "One common Human Resource pool managed by a **Competence Management** team". The competence management team is therefore responsible for the total capacity and development planning for the company. Each individual belongs to the pool and is allocated to one or more tasks or **roles** for a specified period. Depending on the type of task, the employee is part of a **project team** or a more permanent **delivery team**. The team leader is responsible for daily deliveries and for training the team members accordingly, but everyone "owns" its own long term career development plan and prepares this plan together with its appointed competence manager. The plan may consist of elements of formal training but mostly of on-the-job challenges.

The concept of a career and personal development must not be thought of in traditional terms. The career can be both horizontal and vertical in the organisation, but every move should bring some new elements for learning and growth. Our career coaching is in essence to help the employee navigate in our organisation to reach his development goals.

Marianne Harg

This way of working requires that:

- All (or most) vacant roles, both temporary and more permanent, must be published and visible to everyone (real open sourcing).
- The competence management team is responsible for filling all new and vacant roles with the person who fits the best between wanted career development and the needs of the company. This balance is crucial over time to keep a happy and well functioning organisation.
- It is expected that you apply for roles of interest, even if you are engaged in other activities. Use this opportunity to show interest.
- Only one person can fill a role at a time, so it is not considered a failure if you do not succeed with your application every time.
- Your competence manager may ask you to apply if a free role fits your development plan or may discuss if this is a type of role or task you might be interested in.
- If you remain in a certain role for a long time, it is primarily your own active choice, but you will be challenged by your competence manager to make sure your skills are updated and your "market value" is kept high.
- The team leader who is using someone must be willing to release this allocated person and switch to another, within a reasonable timeframe and conditions.
- The team leader may at any time de-allocate a person, who is no longer needed due to capacity reasons. If the reason is competence related, training and suitability must be discussed with the competence manager. A de-allocated person is returned to the resource pool and the competence manager will try to find other relevant roles together with the employee in question and the rest of the competence management team. This part is crucial for the total flexibility of the organisation.

Roles allow greater flexibility than traditional job descriptions. A role is usually connected to a work process, with a description of deliverables and the necessary skills and competences. At any time, one person may take on more than one role, and a particular role may be filled by more than one person. This makes it possible to move people around more freely. We also found that it makes employees more happy as they can try out different roles without adverse consequences (returning to the resource pool is always possible and accepted), use their knowledge for various purposes and do not feel stuck in a department over years. Manager's roles have changed a lot. The role as a team leader, a competence manager or as a member of the company management team are also roles you are allocated to for the period when this is the best place to be and utilize your knowledge for yourself and the company. This means we move in and out of manager and professional roles and are in this way able to keep our core

competencies alive – very useful for all parties as the number of management roles are, and should be, limited.

Team leaders will follow up on performance and expectations, whereas competence managers will discuss – and pay for - continuing development and do career coaching. The competence management team is also responsible for the yearly salary adjustment process, with input from all relevant parties who have observed the performance.

We started with about 250 employees, ending with 650 after some years, and the model has worked extremely well over the 15 years, with low turnover and highly satisfied employees. The most impressive result is the adaptability of the organization as a whole to frequent and quite substantial changes. Each person has developed a robust set of skills and is well prepared for different type of work, and therefore not afraid of changes. The model makes it easier to match individual employee needs and wishes to our business needs. Needs for both parties will vary over time and we have reduced unused capacity substantially. When employing new people it has also been essential to employ those who are able to fill more than one type of role.

This organisational model is well suited for competent people who enjoy networking and can handle a matrix organisation and constant changes. It is more difficult for those who need to feel a strong bond to a smaller group and a stable reporting line.

My own experience after having different roles in this organisation? I would never voluntarily go back to the ordinary square box department model! ❑

CAREER COACHING for **NORWEGIAN ENGINEERS**

NITO

Author:
Marianne Bevum, Senior Consultant

Since 2006, NITO - The Norwegian Society of Engineers and Technologists has provided career coaching services to its members. The career coaching service is both an internet-based service and an individual coaching service. Career coaching is free of charge to all members.

Interactive career coaching

The interactive career coaching facility is based on Flash software with multiple choice questions and assessment scales. Between the different segments there are video instructions.

In the end, the user will be given a résumé based on the answers given, which indicates some important challenges and some general advice.
It is important to emphasise that this is not a character test, nor does it give absolute answers. This is a tool for reflection upon one's current job situation, desires and needs, and what actions are necessary to reach the goals.

Personal career coaching

On request, members are given individual career coaching by trained staff members. Each individual can get up to three separate sessions, each lasting one hour. The coaching sessions are based on the individuals' present situation, their own needs and goals. The coach is only a facilitator to reflection and to action, and the coach rarely gives advice.

NITO has eight trained career coaches among the regular staff; four are based in NITO's local branch offices.

Since the start in 2006, approximately 1800 members have completed the internet-based service. 590 members have had individual coaching sessions.

What are the achievements?

It is difficult to determine the real outcome of the career coaching service and what individual members have achieved from this. Since career planning often is a long term process, and the coaching service is just one part of the whole, one cannot easily point out what was the factor that actually made the changes. The process is also confidential, and we do not require reports on what each individual has experienced from it.

After one or two coaching sessions, feedback from individuals however indicates that they have been given help to get on with their process whether to look for another job position or to determine their present position. They show more confidence in their choice of action.

The overall impression is that the career coaching service is a useful tool for those who are willing to undergo a reflection process, and to take initiatives and responsibility for their own career opportunities. ❑

Marianne Bevum

EXPERT CAREER PATHS for ENGINEERS

Author:
Dr.-Ing. Dipl.-Wirtsch.-Ing. Michael Schanz,
VDE Standing Committees for Engineering Education and Profession

Michael Schanz

Young graduates of the engineering sciences usually look forward to develop technology or develop it further - for safety and quality of life, for the well-being of people. Understandably, the possibilities which a career offers to an engineer, are not yet completely seized by the young graduates and especially not by students or pupils.

An option students and graduates are rather familiar with is to take over - with appropriate performances - a leading function, say good-bye to technology, carry however larger responsibility and receive appropriately higher salary. During their career some engineers develop a taste for responsibilities and finally take over tasks in the general management. These candidates are often those, who did an excellent job in engineering together with good performance in leadership behaviour. On the other hand, there are some cases of excellent engineers, who stick at technology and decide consciously against a career in the technical or general management. Some others become managers; they are however not completely content and lament that they don't work with technology afterwards.

Some large but also medium-sized high-tech enterprises solve this dilemma, in which highly-qualified engineers with willingness to take responsibilities are. The introduction of formal career ladders for experts - thus purely technical high-level personnel – offers, despite high technical relevance, much responsibility, adequate salary and also the acknowledgment within the enterprise. This finally means the better utilization of personnel abilities for the enterprise: No one is to say 'I would like to ascend the career ladder and take responsibility, but not to do without the technical relevance, so I prefer to leave this opportunity out.'

Altogether this company policy leads to an increased portion of engineers with large influence in their enterprises. According to VDE this can become an important factor in strategically crucial situations at high-tech companies, which has in turn a more positive influence on the long-term business success.

In addition, more high-level personnel in the expert career path and thus more engineers in influential positions, means more attractive career perspectives and a broader spectrum of options for graduates.

Then if the portion of high-level technical expert personnel grows and is better known by the society, this will also have a positive influence on the difficult situation of the gap of engineers in western countries. According to an inquiry by VDE, the professors of electro-technology/information technology believe by majority to lose capable talents because one makes easier one's career as a graduate in business administration or law than in engineering. If broader career options become more probable for engineers, this will serve as an argument for talented but undetermined school graduates to decide to start a study programme of the engineering sciences.

Example: major German semiconductor manufacturer

In this global operating company there are more than twenty career steps. Parallel to it, an expert career path, the so-called 'Technical Ladder' exists. It ranges from stage 11 to 18, thus just as highly as upper leadership levels. The entitled functions here are not so familiar as e. g. 'department manager' or 'vice president'. The expert career begins with 'Senior Expert', then it continues with 'Staff Expert', 'Senior Staff Expert', 'Principal', 'Senior Principal', and finally 'Fellow'. Being a 'Fellow' means being a progressive thinker, mentor, and creative director for a vast number of other engineers. In another big German company, the job title 'Distinguished Engineer' is alternatively in use.

Example: medium-sized German engineering services supplier for the automobile industry

Specialized technical experts are of particular importance here, since technical solutions in the automobile industry are often close to the edge of feasibility and require newest engineering know-how. The enterprise differentiates not only two but three career paths: management, project and specialized career. The latter ones are highly technical related and end up earlier than the former.

The (technical) management takes over personnel, administrative and organizational responsibility in their range. This career is particularly interesting for those, who exhibit pronounced social competences besides technical excellence. They make decisions in high-complex situations, lead and motivate co-workers and create at the same time a working climate, which promotes an unhindered information exchange and contributes to the achievement of the common objective.

The projects managers take over the control of a project team, which consists of co-workers, who together complete a temporally limited project. With increasing experience and

depending on the scale of the project the responsibility grows. The co-workers can be involved in projects regionally, nationally or world-wide.

Technical experts can develop themselves further in a specialized career. This is particularly interesting for those, whose emphasis is clearly on technical-methodical area. Highly-qualified engineers keep the possibility, by development of their technical, methodical but also social authority to the specialist. An internal expert puts its special know-how at the disposal of the entire enterprise.

Example: medium-sized German manufacturer of components of solar technology

After a training for all young engineers about important elements of the firm's structure as well as about cooperative communication, there are intended seminars for the career orientation – the so-called Career Compass. Subsequently, the first switches for the respective career are placed, similar to other medium-sized companies there are three paths: the high-level personnel career (first group leaders, then department managers), project manager career (project manager, then senior project manager) and/or expert career (senior Engineer, then Expert Engineer). Within these career paths specific seminar programs some voluntary, some obligatory are offered. Also here, the formal career paths for experts and project managers are shorter.

Example: senior experts' status at a large American developer of Electronic Design Automation (EDA) software

One of the sales co-worker recently reported that the three main developers of the most important products – the microelectronic circuit design inspection tools - received a higher annual management bonus than the members of the executive board last year, since these tools contributed to the largest part of the corporate profit. These particular engineers were more important for the company than the members of the executive board. ❑

70TH ANNIVERSARY

of the Establishment of the Institute of Continuing Engineering Education at the BUTE

(Budapest University of Technology and Economics)

Author:
Prof. János GINSZTLER, President of the Hungarian National Committee for FEANI

On the initiative of the world-famous Hungarian civil engineer, Prof. Gyözö Mihailich, the first Institute of Continuing Engineering Education in Europe was formed in August 1939.
Prominent representatives of the Hungarian Republic participated at the ceremony of the 70th Anniversary, which was held in the Festive Hall of the University. The lecturers appreciated the pioneer role of the Institute and underlined its most important role nowadays and in the future as well. Some of them were awarded, acknowledging their important role in continously developing the portfolio of the Institute. During several years the Institute was privileged with the title of UNESCO-Chair.
Representatives of numerous international organizations, among others the WFEO, expressed their good wishes for our Institute, mentioning its most useful and progressive role in the continuous professional development of the Hungarian and international participants.
There were approximately more than hundred thousand participants at the different courses of the Institute during the last 70 years. The language of the courses was in general Hungarian, but several courses were held partly or totally in English or German. Guest lecturers were invited from Great-Britain, Australia, Germany, Austria, etc.
During the last decades we used the experience which was collected in the FEANI CPD Committee and also in the SEFI Working Group on CEE.
In our today's offer there are more courses dealing with new innovations, or courses which have interdisciplinary/multidisciplinary background. In advertising our new courses we try to follow the demand of our industrial partners. ❑

Prof. János GINSZTLER

EUROCODES TOWARD 2010 and NATIONAL IMPLEMENTATION

Author:
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Background

In 1975 the European Commission decided on the adoption of a programme in the field of construction based on the objective of eliminating technical obstacles to trade which included the harmonization of technical specifications.
For 15 years the Commission, through a steering group made up of representatives from Member States, set about establishing a set of harmonized technical rules for the structural design of construction works which culminated in the publication of the first generation of European design codes in the late 1980's.
In 1989 the Commission and the Member States decided, on the basis of an agreement with the European Standards body (CEN), to transfer the development and publication of the codes to CEN so that they would , through future development, have the status of European standards (EN's).

Barry Smith

Therefore EN Eurocodes, in providing common design methods, expressed as a set of European standards are intended to be used as the recommended means to:

1 prove compliance of building and civil engineering works with Essential Requirement No.1 (Mechanical resistance and stability) and part of Essential Requirement No.2 (Safety in case of fire) as defined in Annex 1 of the Construction Products Directive (CPD) 1,
2 express in technical terms, these Essential Requirements, applicable to the works or part thereof,
3 determine the performance of structural components and kits with regard to mechanical resistance and stability and resistance to fire (in so far as is applicable with regard to CE marking).

The intended benefits of the Eurocodes programme also include to:

- provide common design criteria and methods to fulfil the specified requirements of the Essential Requirements (referred to above),
- facilitate the marketing and use of structural materials and constituent products, the properties of which will enter into design calculations,
- provide a common understanding regarding the design of structures between all associated parties,
- be a common basis for research and development in the construction sector,
- allow for common design aids and software,
- increase the competitiveness of European civil engineering firms, contractors, designers and product manufacturers.

Eurocodes - Parts, Packages and National Provisions

There are 10 Eurocodes, comprising of 58 individual parts, covering 10 design areas. The first two areas (basis of design and actions or loading) are common to all designs, the next six are material specific and the two remaining codes cover geotechnical and seismic aspects.

- EN1990 Eurocode 0: Basis of structural design
- EN1991 Eurocode 1: Actions on structures
- EN1992 Eurocode 2: Design of concrete structures
- EN1993 Eurocode 3: Design of steel structures
- EN1994 Eurocode 4: Design of composite steel and concrete structures
- EN1995 Eurocode 5: Design of timber structures
- EN1996 Eurocode 6: Design of masonry structures
- EN1997 Eurocode 7: Geotechnical design
- EN1998 Eurocode 8: Design of structures for earthquake resistance
- EN1999 Eurocode 9: Design of aluminium structures

The 58 parts of the Eurocodes have been grouped into "packages", each of which specifies the parts needed for a given combination of construction material and structural type. While primarily established to set a common date of withdrawal for related national standards the packages also serve to identify all of the codes required for a particular design including those parts of the relevant common codes (basis of design, actions) as well as those for geotechnical and seismic aspects. Annex C of the European Commission document Guidance Paper L – *Application and Use of Eurocodes*-[2], clearly outlines the relationship between the material based packages and those independent codes.

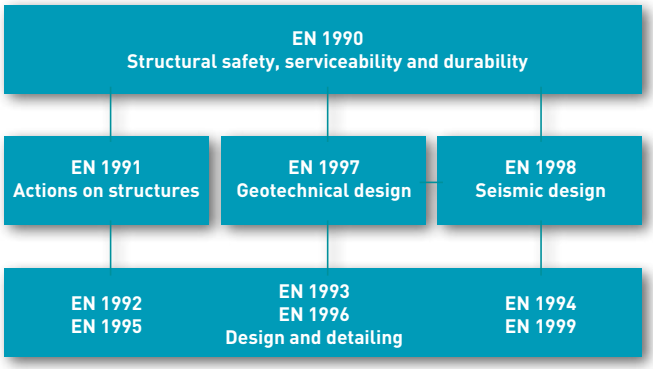

Figure 1 Links between the Eurocodes
The Eurocodes suite is made up by 10 European Standards for structural design. Each Eurocode consists of a number of parts that cover particular technical aspects. The links between the Eurocodes are given in the above figure.

The determination of levels of safety of buildings and civil engineering works, including aspects of durability and economy, has always been considered to be within the competence and authority of individual Member States. Possible differences in geographical or climatic conditions, ways of life as well as different levels of protection that may exist at national, regional and local level can be taken into consideration at national level through specific design parameters which are identified in each Eurocode part as Nationally Determined Parameters (NDP's).
Therefore Member States have choices within the codes in respect of levels of safety, including aspects of durability and economy that may pertain within their territory. Additionally where NDP's are called up, the Eurocode part in question will provide a full set, as appropriate, of recommended values, classes, symbols and alternative methods to be used.

Before Eurocodes can be used for design purpose in a particular Member State, the appropriate national authorities are required to undertake a national calibration period (a maximum of 2 years after the publication by CEN) for each Eurocode part after which it must fix its choice for the related NDP's. Once this has been carried out, a national annex (or decision on the adoption of the recommended values for the NDP's) must be published to facilitate the use of Eurocodes in that country.

National Implementation Programme

The National Standards Authority of Ireland (NSAI), as the national body member of CEN and the national publisher of all European (EN) standards, is coordinating the examination of all Eurocode parts and the development of national annexes through its National Eurocodes Advisory Committee. This committee comprises of experts (Liaison Engineers) for each of the 10 Eurocodes together with representatives from the Department of the Environment, Heritage and Local Government, the Irish Concrete Federation, the National Roads Authority (NRA), the Office of Public Works as well as from academic and industry representative bodies. While a comprehensive technical evaluation of each of the Eurocodes has been and continues to be carried out by the respective Liaison Engineers, particular consideration has been given to a number of the codes and individual parts through the application of externally contracted study programmes. Eurocode 1 parts 1-2 (actions on structures exposed to fire) and 1-4 (wind action) have been subject to such a study and while the EC 1 fire part national annex is now complete and published, the wind part is still under consideration but when available will include a definitive wind map for Ireland. Studies have also recently commenced for EC 2 (concrete) and EC 6 (masonry), being the most traditionally used structural materials in buildings and other civil engineering works. The NRA, as the authority responsible for National road and bridge design in Ireland, is also currently undertaking a review of all the Eurocodes pertaining to bridge design.

As previously stated, Eurocodes can not be used for design purposes until the corresponding national annexes (or decision on the adoption of the recommended values for a given Eurocode part, in which case a national annex will not be produced) are available. However since the Eurocodes parts have become available from CEN, national standard bodies, on recommendation from the Commission, are publishing the codes to promote their existence and to facilitate industry parties in providing the training, skills and all of the necessary software tools required by designers in advance of full national implementation. All Eurocode parts are now available as adopted Irish standards (I.S.EN's) and can be purchased from the NSAI through the on line sales service at ***www.standards.ie*** .

With national implementation of Eurocodes by all Member States scheduled to be completed at the latest by March 2010, work on the development of Irish national annexes is progressing well. While 23 national annexes have been published to date it is expected that a large tranche of draft national annexes will be available for consultation during January 2010. Once a national annex is published for a given Eurocode part a period of coexistence with the corresponding national design codes comes into consideration. This period of coexistence exists until the end of the coexistence period of the last part in the related Eurocode package (referred to earlier). This ensures that national design codes can still be used until all of the relevant Eurocode parts are available for a particular design type. During this time, specifiers and designers are free to use both codes but once the coexistence period is over, the only design standards in place will be the Eurocodes.

A full summary of the status of publication of Eurocode standards, technical studies and the development of Irish national annexes can be found in the standards section of the NSAI website at ***www.nsai.ie*** .

It is important to mention that once Eurocode parts become available as European standards they form part of the application of the Public Procurement Directive3 (PPD) and so public bodies are encouraged to call up the use of Eurocodes during the coexistence periods. While the spirit of the PPD does not preclude the procuring body referencing other design codes, their equivalence to the Eurocodes must be demonstrated by the contractor. In relation to Irish building regulations, once the full set of national annexes is available, the accompanying Technical Guidance Document (TGD) to Part A (Structure) will be revised to refer to the Eurocodes

and their national annexes. Designs carried out using the codes and related national annexes will then indicate, prima facie, compliance with the building regulations.

Future developments

One of the ongoing tasks for CEN TC250 (Eurocodes) is the maintenance of the Eurocode standards, including the need to address corrections and amendments. Future amendments are expected to include improved formulations and presentation of design rules, improved design rules and supplementary design rules.

There are also a number of initiatives currently being considered for the future development of the codes which include:

1 Further harmonization and development of the Eurocodes through:
- improved consistency between design specifications and product specifications including those areas related to Essential Requirements 3 (hygiene, health and the environment), 4 (safety in use), 5 (protection against noise) and 6 (energy, economy and heat retention),
- including additional aspects of sustainability,
- updating rules and specifications according to state of the art research.

2 Establishing guidelines for:
- the assessment and retrofitting of existing structures,
- the design of glass structures including proposals for future test standards,
- the design of Fibre Reinforced Polymer (FRP) structures for both in situ execution, and for manufacturing from prefabricated components.

It is expected that this work will be carried out by CEN TC 250 and the Commission under the auspices of the Joint Research Centre / ELSA unit. To facilitate this and in providing the necessary support data, national standards bodies are expected to upload details of their decisions on the NDP's to the Commissions JRC Eurocodes database.

References

1 The Construction Products Directive (89/106/EEC)
http://ec.europa.eu/enterprise/construction

2 Guidance Paper L – Application and use of Eurocodes
http://ec.europa.eu/enterprise/construction
(follow the links to Guidance Papers / Position Papers)

3 The Public Procurement Directive (2004/18/EC)
http://ec.europa.eu/internal_market/publicprocurement

4 Technical Guidance Document Part A
http://www.environ.ie/en/TGD

Others

European Commission DG Enterprise & Industry Joint Research Centre
http://eurocodes.jrc.ec.europa.eu

Eurocodes Expert – Making Eurocodes Easier
(An Institution of Civil Engineers (ICE) and Institution of Structural Engineers initiative)
http://www.eurocodes.co.uk

CNISF CONFERENCES ON CLIMATE CHANGE

CNISF
CONSEIL NATIONAL DES INGENIEURS ET DES SCIENTIFIQUES DE FRANCE

FR

Author:
Michel Bruder, President of the Committee on Environment of CNISF

From September to December 2009, the Environment Committee of the CNISF organized in Paris a series of 4 conferences on climate change. These conferences were prepared by Michel Bruder, chairman of the Committee and Pascale Braconnot, in charge of climate models at LSCE (Laboratoire des Sciences du Climat et de l'Environnement).

The subject of the first conference was the history of the climate, from the origin of life on earth up to recent times:

The lecturers (members of the LSCE) described the various instruments that enabled the scientists to reconstruct the climates of the past, ice cores, pollens, fossils… The scientists are nowadays able to explain the variations of the climate during geological times. They are induced by a number of external and internal phenomena: periodic

variations of sun's activity, of earth orbit, continental drift, volcanic and biological activities and, of course, human activities.

The subject of the second conference was the origin and development of the predictive models for climate change:

In order to explain how the 23 models used by the IPCC (International Panel on Climate Change) have been established and are still permanently developed, the main scientific basis were explained.

- The energy received from the sun is partially reflected and the rest is reemitted by the earth.
- Different infrared wave lengths emitted by the earth are absorbed by the various greenhouse gases.
- The composition of the atmosphere varies with the altitude.
- Above a given concentration in the atmosphere, a green house gas absorb the totality of the radiations it is able to absorb; when the concentration is above, it has no more greenhouse effect. This is particularly the case for water vapor at sea level.
- The effect of the different kinds of clouds and other components of the atmosphere (for instance sulfur oxides).

These considerations explain why the effect of the different greenhouse gases cannot be taken into account by simple formulas.
The mathematical models simulate the evolution of the climate by using the physical laws. They represent in a tri-dimensional way atmospheric and oceanic circulations, sea ice, continental areas and their coupling.
More recently, the mathematical models have included a coupling between climate change and carbon cycle, leading to a higher forecast of the carbonic dioxide content of the atmosphere and, therefore to a slightly higher temperature.
Conclusions of the conference:

- The climate is going to undergo an important change if the emissions of greenhouse gases are not reduced.
- The geographical distribution of temperature changes is rather well predicted.
- The geographical distribution of rainfall changes is more uncertain.
- The sea level is going to increase.

The subject of the third conference was the use of mathematical models for local predictions, particularly for France:

Up to now, an average temperature increase was observed in France, significantly higher than the worldwide average temperature increase. Rainfalls had a tendency to increase in the north and to decrease in the south and also to increase in winter and decrease in summer. This is coherent with the IPCC predictions and these tendencies should increase in the near future.

Conclusions of the conference:

- A warming up higher on land than on the sea,
- A warming up higher in summer than in winter,
- In summer a warming up higher in the south than in the north,
- In winter a warming up higher in the east than in the west,
- Rainfalls will increase in the north and decrease in the south, but the limit is quite uncertain.
- The increase of the number and strength of tempests in uncertain.

The subject of the fourth conference was the carbon cycle and the acidification of oceans:

From 1990 to 2000, the annual increase of the total CO2 emissions to the atmosphere was around 1%; from 2000 to 2008 the annual rate went up to 3.4%. This is mainly explained by a rapid increase of energy consumption in developing countries mainly based on the use of coal. Although the current financial crisis has caused a lower rate of increase in 2008 and a slight decrease in 2009, it is probable that the previous rate of increase will be observed from 2011 on.
On a total of CO2 emissions corresponding to of 9.9 gigatons (or pg) of carbon from anthropogenic emissions in 2008, 8.7 were due to the combustion of fossil fuels and 1.2 to the change of land use (deforestation). But the increase in the carbon content of the atmosphere corresponds only to about 45% of this value. The explanation is that 29% is absorbed by the biomass and 26% by the oceans.
But the proportion of carbon that will be absorbed in such a way will, according to the modified models, decrease significantly in the future leading to an increase in the CO2 content of the atmosphere and consequently to a significantly higher temperature increase than predicted by the previous models.
But another consequence of the increase of the CO2 content of the atmosphere is a decrease of the pH of the surface water of the oceans. The slightly higher temperature of the surface water does not compensate the much higher concentration of CO2 in the atmosphere. Consequently a decrease of around 0.3 degrees of pH can already be observed and the acidification of the oceans will follow the further increase of the CO2 content of the atmosphere. The potential biological consequences are being studied by a steadily growing number of scientists with no definitive conclusions up to now; but, no doubt, there are risks. ❑

ENGINEERING COUNCIL **CONFERENCE ON ACCREDITATION** HAILED A **SUCCESS**

News release

UK

Accreditation of engineering degree programmes – current requirements and future challenges, the first Engineering Council conference of its kind, was hailed a success by the 80 participants. Mainly representing professional engineering institutions or academia, they made the most of the opportunity to review how the engineering profession goes about accreditation at present and how the process can adapt to the changing environment in higher education.

Key points which became apparent during the day included the need to focus more on the value, rather than the cost, of accreditation. Professional engineering institutions were encouraged to find ways of helping universities to protect the quality of courses in the face of severe pressures on budgets from 2010. In considering the wider value of accreditation, many felt that it should be viewed as a developmental process, with continuing dialogue between universities and the professional engineering institutions encouraged. It was agreed that this would be far more effective than the current approach, which places all the emphasis on a five-yearly visit.

The shift to an outcomes-based system of accreditation in 2004 was widely welcomed. However, some participants from universities felt that the scope for innovation in designing degree courses was still limited by the tendency of accrediting panels to make specific demands about the structure of courses, even though UK-SPEC is intended to be non-prescriptive about this.

Amongst other highlighted challenges was the need to ensure that work-based delivery of academic learning, which is becoming more widely available, meets accreditation requirements.

A General Medical Council presentation provided examples of successful practice that the engineering profession might learn from and consider applying in future, for instance including student representatives on accreditation panels. Another example, following the lead of the GMC, is that more could be done to ensure that the processes of accrediting engineering degrees, and publicising accreditation decisions and departments' progress, are transparent for the benefit of students and the public.

Overall, the engineering profession already has some very good accreditation processes in place. Chairing the conference, Professor Bob Cryan, Vice-Chancellor of Huddersfield University, referred to the IUSS Select Committee's recent praise for the engineering profession as being open, accessible and joined-up, as well as the emphasis that has been placed on the vital role for engineers in tackling global challenges. He reminded delegates of the importance of ensuring that the education of engineering students meets the standards set by the profession and equips them to be competent, innovative and groundbreaking.

Andrew Ramsay
EC[uk] Chief Executive Officer

The Engineering Council's Chief Executive Officer, Andrew Ramsay, concluded, "It was encouraging to hear a consistent voice amongst participants in support of quality and outcomes as being key to address the future challenge of UK HE. We had some very good feedback from participants, and are now looking at establishing a webforum, to enable relevant stakeholder groups to keep discussion open on specific issues."

The full conference report and presentations can be seen on: **http://www.engc.org.uk/education--skills/accreditation/accreditation-conference.aspx**

THE FINNISH ASSOCIATION OF GRADUATE ENGINEERS TEK

WORLD RECORD IN DIAGNOSIS SPEED

News release

FI

Juhani Luotola, M.Sc. (Cell Biology)

The Finnish Engineering Award has been granted annually since 1981. Over the years it has become one of the most appreciated acknowledgements in the field of engineering in the country. The Award is granted to a person or a team that has made a significant contribution to Finnish technology expertise. One of the purposes of the award is to emphasize the importance of engineering and architectual work in the society. The award winners have played a significant role in Finland's rise into the midst of world leaders in technology.

The 2009 Finnish Engineering Award was granted to Juhani Luotola, Senior Technology Manager at R&D in Orion Diagnostica Oy, in recognition for his long-term research and development work in nanotechnology. As a concrete result of this work, extremely fast analysis methods are currently available for medical purposes.

One of the most significant applications is the QuikRead system that is used to measure the amount of C-reactive protein (CPR) in the patient's blood in inflammatory diseases. Test results help physicians to make a diagnosis and assess whether the patient is suffering from a viral or bacterial infection, or to establish whether the administered antibiotic is having the desired effect. The test is the world's fastest in the field, with the result indicated in one minute.

The Award was justified by the development of a complete test entity, which has required nanoparticle synthesis, the exacting application of surface chemistry, and the development of analysis equipment and mathematical interpretation models. Juhani Luotola started his work in this field of science in 1981.

Displaying the results in the right type of light

In simple terms, the analysis method is based on the progress of light through a sample. An accurate sample is taken with the aid of a capillary. The surface of the nanoparticles contains molecules that react with the C-reactive protein.

In cases where a reaction is achieved, the nanoparticles adhere to one another forming larger aggregates. When the sample is subsequently illuminated using a specific wavelength, the measured light is attenuated by an amount that is proportional to the concentration of an analyte in question. A measuring instrument calculates the attenuation and directly displays the result in the form of a numerical value that is easily interpreted by the physician.

The QuikRead CRP test is easy-to-use and especially suitable for health care settings where physicians work close to their patient. It allows immediate testing and provides the test result so quickly that the physician can initiate the appropriate treatment during a single patient visit. Rapid results enhance the overall effectiveness of health-care delivery by reducing the costs and time associated with handling and sending samples to laboratory, communicating the result and patient revisits. QuikRead CRP can also help to avoid unnecessary antibiotic use and the development of antibiotic resistance.

A complex entity

The currently used particle size is about 100 nanometres, with the deviation being about one nanometre. This is important to observe as the analysis is quantitative by nature.

In addition to the particle synthesis, coating the particles with suitable indicator molecules has required a great deal of innovative work and perseverance. The sphere of development has extended to mathematics – to pinpoint the appropriate algorithms for extracting a maximum amount of data from the measurement signals.

On the whole, Orion Diacnostica has been successful in competition. Up until now, the company has been able to avoid product copying by its competitors. The test analysis is an extremely complex entity that requires the type knowhow and expertise which cannot be conjured up from scratch.

The results of Mr. Luotola's development work have been commercialised as part of Orion Diagnostica's QuikRead system. The company has a turnover of 45 million euros, about half of which is received from the QuikRead system and other products involving particle-based technologies.

Chamber of Engineers presents

THE MALTA ENGINEERING EXCELLENCE AWARDS FOR 2009

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The Winners of the eighth edition of the Malta Engineering Excellence Awards (MEEA) were announced on Friday December 4th, 2009, at a reception hosted by the Chamber of Engineers. The awards were presented by H.E. Robbert Gabrielse, ambassador of the Kingdom of the Netherlands, John Scerri, deputy chairman of Malta Enterprise and Ing. Helga Pizzuto, President of the Chamber of Engineers. The MEEAs provide national recognition to individuals and organisations who have achieved outstanding engineering accomplishments.

This year's award for Innovation was awarded to the **IUBS programme team** consisting of the Enemalta Corporation, the Water Services Corporation and IBM. The IUBS project's brief and investment demanded exceptional inter-sectoral competencies, efficiency and technical expertise. The IUBS initiative brings together a sizeable team of experts from all three partner organisations.

The IUBS project presented a complex and interconnected series of challenges relating to sustainability of future energy resources, meter management, customer relationship management and financial considerations with nationwide implications.

The targeted integration of utilities meant that the team had to redesign the business process to replace the existing billing platform and implement a shorter meter-to-cash system. This promises to eliminate paper transactions and to empower endusers who will be able to monitor their own consumption patters. The IUBS programme will also establish a one-stop-shop contact centre to handle all customers and business enquiries and requests.

The MEEAs adjudication committee felt that all of these factors make the IUBS programme a unique and innovative project which deserves this year's Malta Engineering Excellence Award for Innovation.

A second award for Innovation was awarded to **Playmobil Ltd. (Malta)** for embracing a philosophy of Innovation. This is the third time that Playmobil participated in the MEEAs in the past 4 years. Each year the Playmobil submission has featured an innovation to their current manufacturing process, an approach that has ensured that the Malta facility remains competitive in the face of stiff competition overseas.

The Award for Leadership was given to the **Panta Lesco Ltd**. Panta Lesco is a building services contracting company which has been in business for fifty years and during which it has established itself as a leader in large and complex building services projects. Over the years, Panta diversified and expanded its line of products and services within the industry. In its years of operations it has maintained a substantial core of technical and engineering resources.

The award for Lifetime Achievement was awarded to the late **Bartholomew Attard**, founder of the Panta Lesco Group. Throughout his carreer Mr Attard contributed significantly, not only to the Maltese economy and society in general by introducing state of the art products and technology to the island, but also through the significant employment of members of the engineering community.

In her closing address, Ing. Helga Pizzuto President of the Chamber of Engineers, thanked all participants for their efforts and for their participation in the Awards. The MALTA ENGINEERING EXCELLENCE AWARDS has now established itself as a very important yearly event benchmarking the recognition of outstanding engineering efforts by local engineers or engineering companies and the CoE will be inviting fresh nominations during Autumn 2010. Further information can be found at **www.coe.org.mt**

Convention series on **RENEWABLE ENERGY** in **SWITZERLAND**

Sabine Nasitta

Author:
Sabine Nasitta, Project Manager Tage der Technik 2009 of Swiss Engineering STV

CH

Last November twenty events on renewable energy were held under the umbrella of Tage der Technik 2009 in Switzerland. A clear reflection of the increasing commercial interest, as opposed to just scientific and political interest in this sector. Renewable energy is becoming attractive.

Mauro Pellegrini, President of Swiss Engineering STV, is convinced the age of renewable energy has now arrived.

"The age of renewable energy is beginning with the 21st Century", says Mauro Pellegrini, President of the Swiss association for professional engineers and architects, Swiss Engineering STV, at the opening event on November 5. Just like 60 years ago, when computers took up entire rooms and the idea of each employee having their own computer seemed a utopian dream, at present many politicians think it is unrealistic that renewable energy will make an important contribution to future national requirements. "However, there is now a tiny computer in every mobile phone", says Pellegrini. He takes the opportunity of the opening convention of Tage der Technik 2009, a series of annual events related to energy organised by Swiss Engineering STV, to predict that renewable sources will similarly become more widespread in the coming decades.

Rolf Wüstenhagen, Professor of Renewable Energies Management at the University of St. Gallen, is of similar mind. He describes his keynote example of photovoltaics as a market currently subsidised and favoured with green tariffs for political reasons. In around ten years it will, however, be possible to produce electricity from solar energy for the same price as from conventional power stations. In drawing this conclusion from current price developments he is convinced: "We will soon have a self-supporting market".

After a difficult 2009, Andreas Knörzer, Renewable Energy Investment Manager at the Swiss Bank Sarasin, anticipates a return to growth before the end of the year. He regards growth of about 40% in photovoltaics as being possible in 2010. As a result of the US economy boosting measures and strong demand in China he also expects wind energy to grow over 25% worldwide.

More Wind Farms than Gas Power Stations

"The investors can see light at the end of the tunnel", says business school professor Wüstenhagen. Backers and energy utilities now assume investment in renewable sources will pay off. According to Wüstenhagen, this is why they are already securing good sites ranging from favourably oriented roof surfaces on buildings to land for wind turbines. Across Europe more is presently being invested in wind farm than in gas power station capacity. Photovoltaics is in third place behind gas, whereas coal, hydroelectric power and nuclear energy are way down the list.

However, as a business academic he also takes the customers into account. And studies repeatedly confirm their desire for renewable energy. "Utility companies are conservative. Economists would have been alarmed by this latent desire for quite some time!", says Wüstenhagen.

One such utility taking account of the customers' wishes is the Elektrizitätswerk der Stadt Zürich (EWZ). Since 2006 its customers have automatically been supplied with electricity from renewables unless explicitly opted out. Bruno Hürlimann, who is responsible for renewable energy at the municipal utility, emphasises that it is not just private customers that buy renewable energy. The majority of business customers also pay the premium involved. In the age of environmental standards such as ISO 14001 he says it is a question of both customer demand and marketing. "You don't buy just a canvas and a frame when acquiring a Picasso", says Hürlimann during the opening address.

"The Path is the Goal"

During the podium discussion Hürlimann and Konstantinos Boulouchos, ETH Professor of Energy Technology, take care not to let themselves become embroiled in the ideological debates as to whether we should now be striving to achieve the 2000 watt or the 1 tonne CO2 society. "The path is the goal", opines Hürlimann. As the city of Zürich's main potential of energy savings lies in buildings, many difficult

to insulate, Hürlimann is concentrating on staying within the 2000 watt limit in public buildings. For Boulouchos, who is a member of ETH's Department of Mechanical Engineering and involved with combustion engines, the goal of a tonne of CO2 is more appropriate, as it relates mainly to the transport sector. Both, however, agree that global warming makes it necessary and financially sound to invest in energy efficiency and renewable sources.

The opening ceremony of Tage der Technik 2009 was well attended with around 250 participants.

20 Events across Switzerland

The opening ceremony at the ETH in Zürich was the first of twenty events under the auspices of Tage der Technik. These were held right across Switzerland, including the French-speaking part and the Italian-language canton of Ticino. From the visit to a biogas plant through the networking lunch to the lecture series at the ETH, each had its own special character. Consistently good attendance shows renewable energy is a very hot topic. For example, 800 people took part in the ETH event on climate change. Federal Councillor Moritz Leuenberger, who gave a paper and was a patron of the Tage der Technik, attracted a distinguished audience.

Der **BACHELOR** ist **KEIN ABSCHLUSS ZWEITER KLASSE** DE

Author:
Mr. Marco Dadomo, VDI

Ein Bachelor hat heute die gleichen Chancen wie ein Ingenieur mit Diplom oder Master-Abschluss. Das ist das Ergebnis einer Studie, die der VDI jetzt gemeinsam mit dem Institut der Deutschen Wirtschaft Köln (IW) veröffentlich hat. Demnach beschäftigt bereits heute jedes dritte große Unternehmen Ingenieure mit Bachelorabschluss. Knapp 1.800 Unternehmen wurden für die Studie befragt.

Akzeptanz und Karrierechancen von Ingenieuren mit Bachelor- oder Masterabschluss" ist der Titel der Studie, mit der der VDI und das IW die Situation 10 Jahre nach Einführung des Bologna-Prozesses in Deutschland beleuchten. Die Zahlen sprechen für sich: Knapp 11 Prozent der Unternehmen, die Ingenieure beschäftigen, haben bereits Bacheloringenieure eingestellt. Unter den großen Unternehmen ab 250 Mitarbeitern setzt bereits ein Drittel Ingenieure mit Bachelorabschluss ein. „Der Bachelor ist kein Abschluss zweiter Klasse", kommentiert VDI-Direktor Dr. Willi Fuchs die Ergebnisse. „Vor dem Hintergrund, dass es gerade mal knapp 30.000 Bachelor- und Masterabschlüsse gibt, sind die Zahlen erfreulich."

Auch Dr. Hans-Peter Klös, Geschäftsführer des IW Köln, beurteilt die Akzeptanz positiv: „Ein Bachelor hat heute die gleichen Chancen wie ein Ingenieur mit Diplom oder Master." Wichtiger als der Abschluss ist ohnehin die Bewährung der Absolventen im Unternehmen: Neun von zehn befragten Unternehmen geben in der Studie an, dass das für die Karriereentwicklung entscheidend sei. Die Hälfte der Unternehmen räumt Bachelor- und Masterabsolventen die gleichen Chancen ein, eine Führungsposition zu erreichen. Auch in punkto Gehalt unterscheiden sich die Absolventen nur noch wenig. Das Einstiegsgehalt für Bachelorabsolventen ist in der Tendenz zwar häufig etwas niedriger, aber nach drei bis fünf Berufsjahren erreichen Bachelorabsolventen bei 80 Prozent der befragten Unternehmen das gleiche Gehalt wie Ingenieure mit Diplom.

Auch bei den Einsatzfeldern sind keine Nachteile für Bachelorabsolventen zu erkennen: Sie finden sich in allen Bereichen wieder. In marktnahen Bereichen, wie zum Beispiel im Vertrieb, werden sogar bevorzugt Bachelor eingesetzt. Lediglich in der Forschung sind die meisten Unternehmen noch etwas reserviert gegenüber den neuen Abschlüssen, hier wird oft eine Promotion vorausgesetzt.

Die aktuelle Kritik der Studenten gegenüber dem Bachelorstudium ist aus Sicht des VDI berechtigt. „Die Einführung der neuen Abschlüsse war und ist sinnvoll", sagt Fuchs. Allerdings sind in der Umsetzung handwerkliche Fehler gemacht worden. Diese müssen Politik und Hochschulen nun nachbessern, um vor allem die hohe Abbrecherquote in den Ingenieurwissenschaften zu reduzieren. ❑

Bachelor degree students are welcome in German industry

According to a study conducted by Germany´s largest engineering organisation, VDI, together with the Institut der Deutschen Wirtschaft (Institute for the German Economy) in Cologne, bachelor degree students are no second class employees. They are offered the same career opportunities as master degree students and they receive almost the same salary. Although bachelor degree students seem to be underrepresented in research and development areas they easily find their workplace in marketing and sales environments, the study concludes.

Deutsches Kompetenzzentrum für **RESSOURCENSCHUTZ GEGRÜNDET**


Nicole Freiberger

Author:
Dr. Nicole Freiberger

DE

Um eine dramatische Zuspitzung begrenzter Ressourcenverfügbarkeit zu umgehen, wird es nicht reichen, die Effizienz in der Anwendung um einige Prozentpunkte zu steigern. Es muss eine Verbesserung der Ressourcennutzung um eine ganze Größenordnung erreicht werden, wenn aktuelle Lebensbedingungen und Wohlstand erhalten werden sollen.
Um die enormen Potenziale für einen effizienten Einsatz von Ressourcen im produzierenden Gewerbe erschließen zu können, haben das Deutsche Bundesumweltministerium und der Verein Deutscher Ingenieure e.V. (VDI) ein Kompetenzzentrum für Effizienztechnologien gegründet.
VDI-Präsident Prof. Bruno O. Braun: Für uns ist „Ressourceneffizienz die Grundlage für ein ökologisch verantwortungsbewusstes Handeln. Und der Schlüssel für den Erfolg unserer Wirtschaft im globalen Wettbewerb. …Deutschland ist schon heute Exportweltmeister in der Umwelttechnik. Diese gute Position müssen wir in den relevanten Technologien ausbauen, denn bis 2020 wird sich der weltweite Umsatz bei Umwelttechnologien verdoppeln. Deutschland muss zu einem Leitmarkt für Ressourceneffizienz werden. “

Das VDI Zentrum Ressourceneffizienz (ZRE) ist mit dem Auftrag gegründet worden, den integrierten Einsatz von Umwelt-, Ressourcen- und Klimaschutztechnologien allgemein verständlich und umfassend darzustellen und zu fördern. Dazu werden Informationen, Wissen und die Expertise im Hinblick auf den effizienten Einsatz von Ressourcen gebündelt, aufbereitet und auf breiter Basis zur Verfügung gestellt. Darüber hinaus hat das ZRE die Aufgabe politische Institutionen zu beraten, Hemmnisse zu identifizieren, Anreiz- und Förderprogramme zu initiieren und gesetzliche Vorhaben in Bezug auf Ressourceneffizienz zu begleiten. **Die fachlichen Schwerpunkte liegen zunächst im Bereich produzierender Unternehmen und im Baugewerbe** - und damit insbesondere bei kleinen und mittelständischen Unternehmen. In diesen Branchen finden sich nicht nur erhebliche Einsparpotenziale im Materialverbrauch und der Prozessgestaltung; Effizienzsteigerungen machen sich bei ihnen auch besonders schnell durch Kosteneinsparungen bemerkbar.

Die politische Gestaltung der wirtschaftlichen Rahmenbedingungen hat bislang dazu geführt, dass **seit Anfang des letzten Jahrhunderts die Arbeitsproduktivität um ein vielfaches gestiegen ist. Eine wahre Effizienzrevolution beim Faktor Arbeit. Leider gilt das nicht für den Umgang mit natürlichen Ressourcen**. Selbst die Einführung zahlreicher neuer Technologien gerade in den letzten Dekaden hat die Rohstoffproduktivität kaum gesteigert. Neben der Wirtschaft selbst ist hier auch die Politik gefordert, Rahmenbedingungen zu schaffen, mit denen wirtschaftliche und gesellschaftspolitische Hemmnisse abgeschafft und wirksame Anreize zum schonenden Umgang mit Ressourcen gesetzt werden können – und das europaweit. **Der Stellenwert der Ingenieure und innovativer Technik wird einen erheblichen Bedeutungsschub erfahren, wenn Konsum und Wirtschaft auf geringeren Ressourcenverbrauch umgestellt werden.** Das ZRE rechnet damit, dass neben der Energieeffizienz auch der sparsame Umgang mit Ressourcen auf europäischer Ebene zu einem gemeinsamen Ziel werden wird.

Kompetenzzentrum

Das VDI Zentrum Ressourceneffizienz mit Sitz in Berlin ist eine Tochter der VDI GmbH und wurde im Juni 2009 gegründet. Für das Kompetenzzentrum stellt das BMU bis Ende 2011 rund 5,2 Millionen Euro aus seiner Klimaschutzinitiative zur Verfügung. Geschäftsführer des Zentrums ist der frühere Präsident des Bundesverbandes Erneuerbare Energien (BEE), Johannes Lackmann. Lackmann verfügt über viel Erfahrung mit der Nutzung von innovativen, umweltfreundlichen Technologien. ❑

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Summary

To prevent a dramatic decrease in resources availability, it is not enough to increase the efficiency in the utilization of resources by a few percentage points. There must be an improvement in resource usage by order of magnitude if conditions in prosperity are to be preserved.
To tap the huge potential for an efficient use of resources in the manufacturing sector, the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and the Association of German Engineers (VDI) founded a competence center for new efficiency technologies.

ENGINEERS DIVE THE WORLD OVER... AND UNDER

In the 21st Century, the engineer-diver will play a crucial role, writes Thomas Collins of CEI Collins Engineering, a CPD Accredited Employer

Ireland, like other countries around the world, faces numerous infrastructural challenges in the 21st century. More than two-thirds of the Earth is water, and some of the most important infrastructure consists of industrial ports; commercial harbours; power plants with water intakes; offshore energy turbines; offshore oil platforms; coastal oil refineries/pipelines; coastal wave-power generation stations; potable water treatment facilities with water intakes; wastewater treatment facilities with water outfalls; waterway bridges; aqueducts; drainage basins and stormwater facilities; canals; wetlands; watercourses; recreational marinas; and water storage/ transmission facilities. Engineer-divers are involved in infrastructure related to all sectors including transportation, energy, health, agriculture, commerce and tourism. With globalisation and worldwide work being performed in, under, adjacent and around water, underwater infrastructure is a critical aspect of all local economies. Provision of specialist engineer-diver and related services ensures the safety of structures for the travelling public and also reduces whole-life facility costs. The underwater engineering specialty has become more crucial and technologically advanced over the years. There continues to be a shortage of qualified commercially trained engineerdivers throughout the world. The underwater inspector should be an engineer familiar with structural inspections. As a minimum, underwater inspectors should have a qualification equal to or exceeding above-water inspectors. Collins' training policy ensures that, first and foremost, our staff are engineers and the commercial diving qualification gives the engineers the opportunity to travel to places where engineers rarely get the opportunity to go.

US Navy origins

The US Navy, despite having the largest fleet of highly trained divers in the world, contracts professional engineerdivers to perform its underwater inspections. Since the programme's inception in 1980, nearly every US Navy facility in the world has been inspected underwater at maximum intervals of three to six years, and newly constructed structures, and repairs to structures, are inspected during and at the end of construction, ensuring proper construction techniques and contract compliance. Because the programme is one of the oldest and most extensive, its standards have been adapted by many other organisations. Even those engineers who carefully inspect above-water portions of structures, often fail to inspect the most basic element of the facility, the foundation, when it is underwater. Diving inspections are not

only a safeguard against failure and possible loss of life, but are also useful as a part of general maintenance and repair programmes. The cost of a diving inspection is very small compared to the savings that can be realised. For example, deterioration of concrete members at and below the waterline is quite common and the condition can often be seen at the waterline. The extent of such deterioration, however, is not easily determined by inspection above the waterline. In preparing contract documents for the repair work, the engineer would not know, with certainty, whether to specify minor patching at the waterline; call for a complete or costly cofferdam (a watertight enclosure pumped dry to enable construction work to be done) to make large-scale repairs; or require construction of an entirely new foundation system. An inspection of the area immediately below the waterline may be possible by reaching down into the water from a boat, but to base major repair work or the safety of a structure on such limited information is accepting an unnecessary risk. An underwater engineering inspection can remove this uncertainty. Economic growth during the last ten years in Ireland and the United Kingdom has been accompanied by population growth, significant housing development in areas adjacent to urban centres, and major road and highway construction.

Land cover

In Ireland, for example, population growth has resulted in construction of large areas of impervious surfaces. A database of land cover in Ireland (CORINE) shows that artificial surfaces increased from 1.5 to 1.9 per cent of total land cover from 1990 to 2000 and similar, or greater, rates of urbanisation can be expected to have occurred since 2000. Increases in land cover can be expected in the future as more hard surfaces are constructed for roads, and commercial and residential development. Normally, a pattern of minor scour-and-fill cycles occurs within a stream, but with rapid urbanisation, runoff volumes to waterways will increase and there can be greater concentration peaks. These higher flows can scour a channel bottom more deeply than previously, and structures which have a long history of satisfactory performance could be undermined or lose lateral support. With bridge scour being topical at present, it is noted that most of Ireland's and the United Kingdom's bridges are masonry arches built on spread foundations that have been stable for years, however these structures are now subject to increasing, and more regular, water flows as urbanisation leads to scour. Within the past thirty years, for example, there have been a number of bridge failures with loss of life and costly property damage due to underwater conditions, particularly in the United States of America.

In New York State in 1987, the Schoharie Creek Bridge collapsed due to scour, killing ten people; in 1989, the Hatchie River Bridge in Tennessee collapsed due to scour and pile failure, resulting in eight fatalities. Notable bridge failures that have occurred in the UK and Europe due to scour and undermining include Traun River Bridge, Austria in 1982; in 1989, the River Ness Railway viaduct in Scotland failed during a flood; and 2001 saw the collapse of the River Douro Bridge in Portugal resulting in 67 fatalities due to flooding and undermining. In evaluating bridges and other waterfront structures for scour, a multi-disciplinary approach is needed. Structural engineer-divers inspect the existing structures to determine if any undermining has occurred, to detect signs of distress due to undermining or settlement and to evaluate the effect of current conditions on the bridges' structural condition. Hydraulic engineers evaluate the hydrological and waterway conditions and estimate

current and future flows. In Ireland, with its recent rapid growth and boom in housing and commercial development, this is especially important. They must also predict the scour that will result from future waterway flows.

Underwater pioneers

Collins pioneered the role of the engineer-diver in 1979 and now employs more engineer-divers than any other engineering organisation. In-house engineer-divers are recruited and trained to design, inspect and assess any type of underwater structure from bridges to dams, from quay walls to multi-piled port facilities. The training focuses on high risk situations, for example, underwater pipelines, penstocks, culverts and bridge piers. Collins operates to a safe system of work with respect to engineer-diving. At the inception of a project, the project manager creates a diving project plan. This consists of a detailed description of the inspection works required on site and client objectives and outcomes required. The project plan also contains a detailed risk assessment and mitigation measures required to reduce the risks as much as possible. Also contained within the project plan are a full list of client contacts, emergency contacts and a list of the decompression chambers available in the country in question. The dive team, which consists of four persons (minimum number set by safety regulatory authority), the dive supervisor, diver, standby diver and tender, will be named within the project plan along with the method of diving, i.e., scuba or surface supply diving.

An inspection

At the outset of the underwater inspection, a pre-dive briefing is undertaken by the dive supervisor, who has overall responsibility for the diving operation. This consists of briefing the team members on the tasks to be undertaken; safety and emergency procedures for the diving equipment being used; unusual hazards or environmental conditions likely to affect the underwater inspection; and any modifications to the operating procedures necessitated by the specific diving operation. Pre-dive check forms are then completed by the dive supervisor prior to a diver entering the water. On completion of a dive, the engineer-divers undergo a post-dive check and diving record sheets are completed. Due to limited underwater visibility, the inherent access restrictions of the underwater environment, and the presence of marine growth, the required underwater diving inspection precision depends on the level of effort. Three underwater diving inspection levels of effort are commonly used. The expected underwater diving inspection precision is based on the individual coverage percentage of these three levels of effort. An underwater diving inspection should include at least a Level I effort on 100 percent of all underwater elements, a Level II effort on 10 percent of all underwater elements, and a Level III effort as recommended by the dive supervisor or specifically requested by the client. A Level I inspection is a visual examination or tactile examination using large sweeping motions of the hands where visibility is limited.

A Level I effort must be detailed enough to detect obvious major damage or deterioration due to overstress or other severe deterioration. It should confirm the full-length continuity of all members and detect undermining or exposure of normally buried elements. A Level I effort may also include limited probing of the substructure and adjacent channel bottom. The Level II effort is intended to detect and identify damaged and deteriorated areas that may be hidden by surface bio-fouling. A Level II inspection requires marine growth to be removed from portions of the structure. The thoroughness of cleaning should be governed by what is necessary to discern the condition of the underlying material. The Level II effort should also focus on typical areas of weakness such as attachment points and welds. Level III effort is generally limited to key structural areas which are suspect or areas which may be representative of the underwater structure.

A Level III inspection typically involves non-destructive testing (NDT) or partiallydestructive testing (PDT) to detect hidden or interior damage, or to evaluate material homogeneity. Testing techniques typically include the use of ultrasonic, coring or boring, and in situ hardness testing.

Hi-tech equipment

Additional equipment is utilised underwater to aid the engineering inspection. This consists of an underwater digital camera, underwater video recording, if requested by the client, or, in certain circumstances, an ultrasonic thickness meter to record steelthicknessesandabathycorrometer to determine the corrosion of subsea structures. Sampling and associated testing of microbial induced corrosion (MIC) bacteria is undertaken where necessary to confirm the presence of these bacteria on marine structures. MIC is also commonly referred to as accelerated low water corrosion (ALWC). Although hands-on visual and/or tactile inspection by a qualified engineer-diver is the only way to truly determine structural condition with certainty, advancements in underwater acoustic technology have created new tools to assist the engineer-diver in this endeavour. After extensive research, Collins selected and purchased a Kongsberg Mesotech High Resolution Scanning Sonar with both imaging and profiling transducers. The company custombuilt several sonar deployment and support apparatuses to properly position and stabilise the sonar unit to optimise accuracy during both imaging and profiling scanning operations. Using acoustic imaging, high resolution scans can be performed of the underwater portions of a structure, as well as the channel bottom or seabed surrounding the structure. These scans enable clients to be shown exactly what the divers saw or felt below water, regardless of water clarity, and this technology helps to identify potential structural deficiencies and hazards prior to entering the water, thereby increasing the efficiency of the diving engineer. In addition, using acoustic imaging while the diver is in the water, allows Collins topside personnel to direct the diver to specific areas of interest during the inspection. Using acoustic profiling, quantitative measurements can be made of belowwater structure configurations, structural deficiencies, and scour depressions. ❑

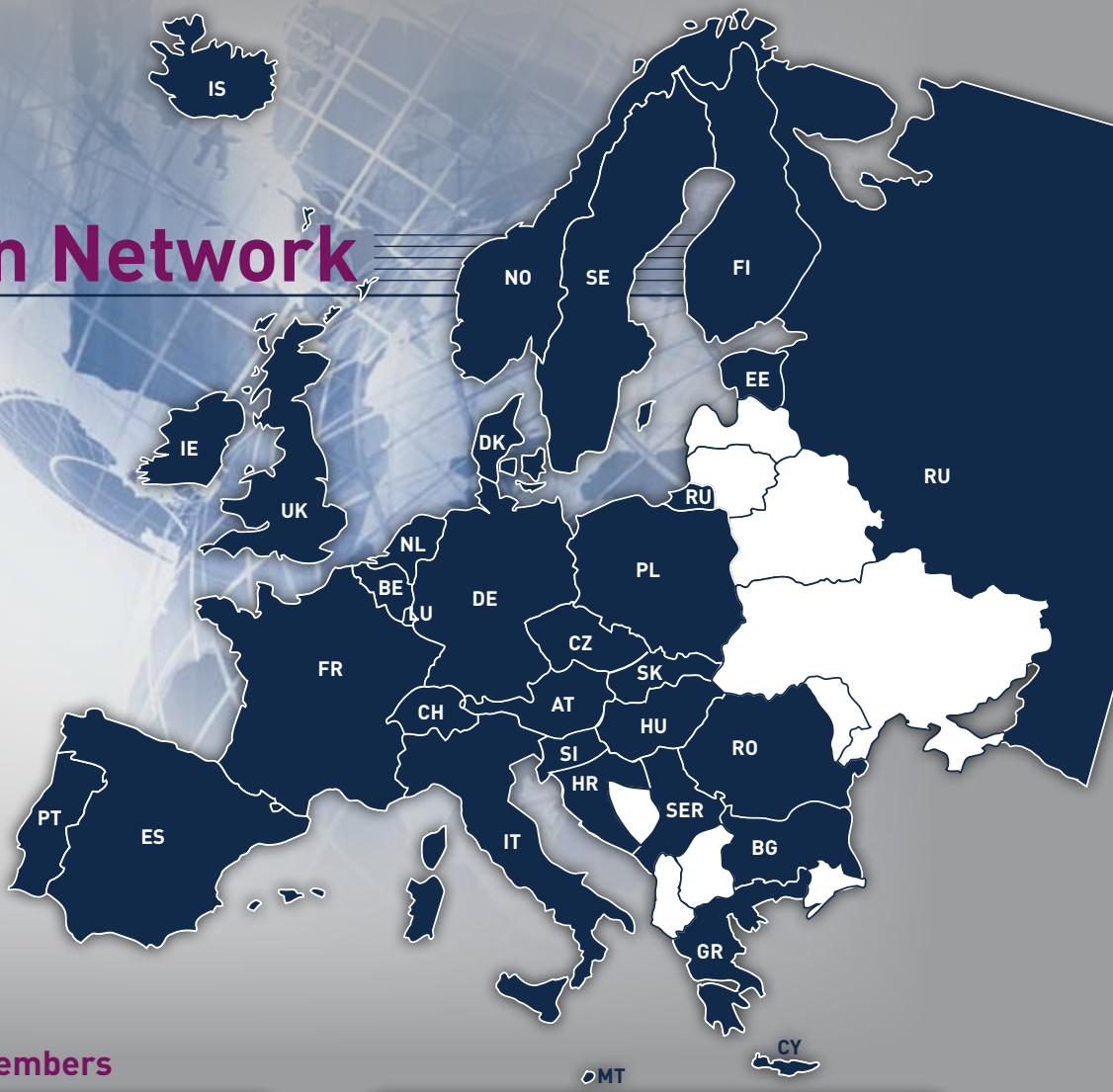
This article first appeared in the Engineers Journal, the official publication of engineers Ireland, in October 2009.

ENGINEERS IRELAND

Thomas Collins, Chartered Engineer and President of the Collins group of companies has over 40 years of experience in the design and inspection, above water and underwater, of railway and highway bridges, foundations, waterfront facilities and related structures. He pioneered the role of the engineer as a diving inspector, and has authored papers and lectured on the inspection, scour assessment, and repair of bridges. His most recent addition to a long list of achievements is the development of the Federal Highway Administration course 'Underwater Bridge Inspection' for which he is also the chief presenter.

CEI Collins Engineers Limited (Collins) is a part of the Collins Engineers, Inc. group of companies, a multi-discipline specialist consulting engineering firm headquartered in Chicago, USA. The group was founded in 1979 and has developed core areas of expertise in civil, structural and underwater engineering with twelve offices in the USA and offices in Dublin and Newry.

European Network



FEANI National Members

AT **ÖIAV** - Österreichischer Ingenieur-und Architekten-Verein

BE **CIBIC** - Comité des Ingénieurs Belges / Belgisch Ingenieurscomité

BG **FNTS** - Federation of Scientific Technical Unions in Bulgaria

CH **REG** - Schweizer Register der Ingenieure und Architekten
SIA - Swiss society of Engineers and Architects
STV/UTS - Swiss Engineering STV

CY **CPEA** - Cyprus Professional Engineers Association

CZ **CSVTS** - Czech Association of Scientific and Technical Societies
CKAIT- Czech Chamber of Chartered Engineers and Technicians

DE **DVT** - Deutscher Verband Technisch-Wissenschaftlicher Vereine

DK **IDA** - Ingeniørforeningen I Danmark

EE **EAE** - Estonian Association of Engineers

ES **IIE** - Instituto de la Ingenieriá de España
INITE - Instituto de Ingenieros Técnicos de España

FI **UIL** - The Union of Professional Engineers in Finland
TEK - The Finnish Association of Graduate Engineers TEK

FR **CNISF** - Conseil National des Ingénieurs et des Scientifiques de France

UK **EC^{UK}** - The Engineering Council UK

GR **TCG** - Technical Chamber of Greece

HR **HIS** - Croatian Engineers Association

HU **Budapest University of Technology and Economics**

IE **Engineers Ireland**

IS **VFI** - Association of Chartered Engineers in Iceland
TFI - The Icelandic Society of Engineers

IT **CNI** - Consiglio Nazionale Ingegneri

LU **A.L.I.** - Association Luxembourgeoise des Ingénieurs

MT **COE** - Chamber of Engineers

NL **KIVI NIRIA** - Koninklijk Instituut Van Ingenieurs

NO **NITO** - The Norwegian Society of Engineers and Technologists
TEKNA – The Norwegian Society of Chartered Scientific and Academic Professionals

PL **NOT** - Polish Federation of Engineering Associations

PT **Ordem Dos Engenheiros**

RO **AGIR** - The General Association of Engineers in Romania

RU **RUSEA** – Russian Union of Scientific and Engineering Associations

SE **SVERIGES INGENJÖRER** - The Swedish Association of Graduate Engineers

SER **SITS** - Union of Engineers and Technicians of Serbia

SI **ZDIT** - Association of societies of engineers and Technicians

SK **ZSVTS** - Association of Slovak Scientific and Technological Societies