

## ***FEANI Position Paper***

### **Engineering Skills Shortage in Europe**

*How do we solve it?*

**approved by the FEANI General Assembly on 5 October 2007**

#### **Introduction**

Both European national governments and the EU Commission have put forward some very ambitious visions for the future of Europe, but one vital obstacle may jeopardize these. The obstacle is the current shortage of engineers on many European labour markets, and the worsening situation in the future, because of demography and a declining interest in science and technology studies.

Therefore FEANI has decided to prepare this position paper in order to put forward some suggestions about how the current and future shortage of engineering skills can be dealt with.

#### **Background**

In order to meet the challenges of “globalization” and the new international division of labour many national European governments and the EU has set up a number of ambitious goals. Some of the goals are contained in the Lisbon agreement, where the EU countries have agreed to be the worlds leading “knowledge region”. This implies, amongst other things, that the countries have agreed to spend at least 3% of national GDP on research and development.

Also the threats from climatic changes have led the EU to decide some ambitious goals on waste handling, energy policy and developing renewable energy sources.

To achieve these goals, and other targeted measures, the EU needs to improve the skill levels of its workforce. Especially within engineering skills, there will be an increase in demand from both the public and the private sector. The public sector will need more engineering skills to meet the infrastructural challenges within the energy sector, transport, health care, waste handling, education etc.

Also the private sector will need more engineering skills if it wants to reap the benefits of the changing international division of labour. Europe will not be able to compete within many of the labour intensive segments of production and services – if we want to preserve our income level and our welfare systems. Therefore private companies need to be more technology and research intensive, and this demands a continued growth in the pool of engineering skills in the companies.

Until recently, the growing demand for engineering skills in both the public and private sector in Europe was met by a complementary growth in both relative and absolute supply, but in the past 15 years there has been a decrease in the relative number of graduating engineers in Europe<sup>1</sup>. In some European countries the lack of engineers is already evident. To make things even worse, the generally ageing European population, in combination with the age-structure of the engineering workforce, results in a massive retirement from the engineering profession in the near coming future, and at least by then, the shortage of engineering skills will be a joint European problem<sup>2</sup>.

The result on the bottom line is that European visions about staying competitive and creating a sustainable society, will be halted by an already existing and growing shortage of engineering skills – if nothing is being done about it.

Therefore FEANI finds it urgent to address the “shortage problem” both within each European country and on an overall European level. Many European countries have already taken national actions, but in FEANI we believe there will be comprehensive synergetic effects in a joint European effort to expand and utilize the pool of engineering skills.

Below, FEANI puts forward some views and some proposals on what can be done – both immediately and in the long run.

### **Short-term recommendations to expand supply of engineering skills in Europe.**

#### **a. Increased mobility on the EU labour market**

In the short run there are several options for expanding the supply of relevant engineering skills. An increased mobility on both national and European labour markets will contribute to a better utilization of the available labour force within engineering, and thus result in a decrease in the foreseen overall shortage.

Therefore FEANI recommends that the 2006 Year of Mobility will be continued and new mobility measures within the engineering profession will be taken. One of the initiatives that need to be further elaborated and implemented is the European Engineering Professional Card – ENGCARD. But also European Employment System (EURES) need to be targeted at creating more mobility within the engineering labour market, - including non-EU engineers with a European Green Card (see Passage b).

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<sup>1</sup> I.e. described in the OECD Policy Report “Evolution of Student Interest in Science and Technology Studies”, May 2006.

<sup>2</sup> It has not been possible to find statistical data on an overall European level, but in Appendix A some country specific reports are authored by members in the working group on the present position paper. The countries are France, Germany, Slovenia and Denmark.

One special obstacle to mobility on both European and national labour markets is the employers growing use of restrictive competition and job clauses. Therefore FEANI urges that arrangements and agreements are put up to limit these clauses to an absolute minimum.

#### **b. European Green Card**

Countries like Canada, Australia, Singapore and the U.S. have with great success implemented so-called Green Cards, which grants a work permit to foreigners who possess some appointed educations and/or skills that are wanted in the host country. Green Cards are typically issued to people with higher educations or skills that are not available at national labour markets like nurses, construction workers etc. Also many European countries have introduced Green Card arrangements, but it is mainly the English speaking countries UK and Ireland who have achieved some kind of success in attracting non EU specialists, while the others have mostly achieved very limited success

By introducing a common EU Green Card, working and living in Europe will be far more attractive for the specialised and globally oriented engineers and others with skills in high demand. The internationally oriented specialists target labour markets, which can offer the most interesting and advantageous job opportunities and careers, and therefore also considers the volume of personally interesting opportunities before choosing a destination.

By introducing a common EU Green Card, FEANI believes that the sheer volume of job-opportunities to choose from will make Europe far more attractive to engineers and other specialist, and thereby contribute to limiting the skill shortages and to a more dynamic labour market.

#### **c. Targeted further education of unemployed engineers and others with relevant skills.**

Even though there are shortages of engineering skills, there are at the same time a number of unemployed engineers. This is of course due to the fact that there are many kinds of engineers within several professional areas, and because some engineering skills become obsolete because of technological developments.

In most European countries the unemployment rate among engineers is relatively low and decreasing, but this only means that the mismatch between demands at supply is growing. It is obvious, that with a continued increase in demand for engineering skills and a decrease in supply, the mismatch between the skills of the available unemployed engineers and the employers' demands is growing.

Therefore, an effort is needed to facilitate a better match between supply and demand, through targeted further education and/or training schemes for unemployed engineers and others with relevant educational and professional backgrounds.

#### **d. Special focus on senior engineers.**

A disproportionate number of the unemployed engineers are seniors – i.e. 50 years or older. This is a general European phenomenon that we cannot afford in the current and future situation where engineers will be a scarce resource.

When employers lay off senior engineers, the seniors generally have a harder time finding a new job than younger engineers. This can be ascribed to “worn down” skills or to prejudices among employers. Research in several EU-countries has also shown that many engineers are being forced to retire earlier than they want to, because they do not feel that their engineering skills are being appreciated or valued properly or because early retirement schemes influences employers to hire younger engineers.

But in fact senior engineers are a very valuable labour force with some very special contributions to the labour market. Especially their experience seems to be underestimated by many employers who in some situations tend to focus too much on technical skills. Engineers are often the “bridge” between different types of professions, and seniors have valuable experiences in being this kind of bridge. Especially small and medium sized enterprises could in many cases boost their performance by hiring senior engineers, and therefore a campaign should be launched to promote all the advantages of senior engineers and removing the fears and threats that many employers feel towards an experienced engineer with “too many and hidden skills”.

To keep the seniors professionally updated also calls for a more responsible attitude and concrete actions from both authorities, employers and from labour unions. All parties need to put more focus on life long learning, career development and retirement plans in order to maintain the engineers on the labour market – as active engineers.

#### **e. Promotion of best practises**

The shortage of engineering skills have been acknowledged and experienced for some years now in many European countries, and therefore many initiatives has been taken already to counterbalance the current problems and the predictions of a growing future shortage.

Therefore it is obvious to share the practises that has been used concerning re-entry of unemployed engineers, maintaining seniors on the labour market (in both its meanings), campaigns directed towards small and medium sized enterprises, Green Card arrangements and branding campaigns abroad, cooperation and alliances between employers and employees organisations and with public authorities etc.

Australia, USA and Canada have all formed national boards to collect best practises and develop new national policies and initiatives. FEANI recommends that the EU do the same.

## **Long-term recommendation to secure supply of engineering skills in Europe.**

### **f. Create awareness of positive contributions to society by engineers and technologies**

In countries like India, China and other developing countries, engineering and technical skills have a high status in the public opinion. This can probably and partly be ascribed to the circumstance, that engineer's contributions to society are very visible in these countries. The introduction of new technologies and big infrastructure projects all adds very concrete benefits to individuals, families and local societies – thus making engineers “every day's heroes”.

In more developed countries, a kind of technological saturation and technology fatigue has been reached as societies have moved further away from subsistence level and people are being more and more focused on non material issues. By having moved so far away from subsistence level, people in the developed countries can also afford to be more critical towards the technologies that have been applied and focus on negative aspects like tendencies to technology determinism, noise effects, green house effects, pollutions etc.

But also technologies themselves are becoming a kind of “black box” to most people because they are more and more complex, smaller and almost invisible in many cases. Therefore, it is important that the positive contributions that still derive from engineers to society are made more visible and as a part of the solutions to many of the vital problems we are facing today.

FEANI proposes that campaigns are being launched targeted at different groups of people – for instance children and youngsters in primary and secondary schools, parents, professional guidance counsellors etc.. The aim of the campaigns will be to show the positive contributions to society by engineers and technologies, but also how important engineers are if we want to solve crucial problems on both global and national levels - and still maintain our standards of living and welfare.

### **g. Branding of engineering studies and the engineering profession in general**

In many cases the engineering studies are, in the public opinion, being regarded as very technical, without foothold in societal needs and mostly appealing to nerds. Probably, this view can also partly be ascribed to the above-mentioned “remoteness from subsistence level and focus on non-material issues”.

But, it may also be ascribed simply to insufficient knowledge about the content of the studies and about the interesting and “trendy” jobs and careers that engineers often holds. Most young people of today want to have “a meaningful job and make a difference to society” – as they express it themselves. And many of them do not connect the engineering profession to this vision.

This can partly be ascribed to the perception of the engineering profession in general, but it can also be ascribed to the guidance they receive from the professional guidance system. Many of the guidance counsellors are not acquainted with the very big variety of job-opportunities connected to an engineering degree, and thus they are not able to give a just description of the studies and the multiple opportunities they provide.

Most often they are not able to describe the interdisciplinary aspects in the engineering profession. For both the public in general and for most counsellors, for example an IT-programmer just does programming. They are not aware that a programmer can have a very interesting job where she spends most of her time working together with a variety of professionals in an international environment and solving a very complex and important problem. This kind of job would appeal to many young people, especially in combination with the proposals in Passage f.

Therefore the engineering studies need branding, and an information campaign needs to be launched, about the many and interesting job opportunities for engineers. The responsibilities for these actions lie both with the public authorities, universities, counsellors, employers and the engineering societies.

Many EU countries have already launched this kind of campaign, especially targeted against children and youngsters. FEANI finds it important to learn from these best practises, and to boost the campaigns to a European level. Many of the national campaigns contain an “engineering contest” for different age groups, schools, regions etc., and similar European Engineering Contests could be introduced as a part of such a European campaign<sup>3</sup>.

#### **h. Branding of the engineering profession to targeted groups.**

Additional to a more general branding of the engineering profession, FEANI believes that further results can be achieved through campaigns directed towards specific groups like women, skilled workers, ethnic groups etc.

Women are not attracted to the engineering profession to the same extent as their male counterparts, and therefore there seems to be an unexploited potential. Examinations has shown, that women are generally not attracted to the same “features” about the engineering profession as men are, and therefore a campaign directed towards girls and women need to put special emphasis on the “features” that attract females. The engineering studies as such, could simultaneously be made more appealing to females by adjustments.

Skilled workers can be another potential target group for campaigns. Experiences in some European countries have shown that within the group of skilled workers, a group exists, who would be interested in using the skills they already posses as the basis for further education to become an engineer. Such a campaign will of course profit from an education system aimed at this group and programmes that make it economically possible for skilled workers to take this kind of further education.

Third groups, which in some European countries have been successfully targeted, are immigrants and refugees. Amongst these groups it is often still prestigious to be an engineer, and therefore campaigns that encourages them to go in that direction – often through role models – seems to be successful.

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<sup>3</sup> DG Education and Culture has taken some initiatives in this field.

### **i. More and better teachers and teaching equipment**

In many European countries, there is a shortage of teachers within the fields of mathematics, physics and chemistry in both primary and secondary schools. This means that specialist teachers do not always give lessons in these fields. This can be a problem when it comes to the professionalism, but it can also be a problem because these teachers are not able to make the lessons interesting and relevant for the students. This can be ascribed to the lack of both professional and pedagogical skills but also to the lack of interest in the disciplines.

This lack of professionalism and interest in mathematics, physics and chemistry in primary and secondary schools, are probably one of the main reasons for the dwindling interest among the students too, and thereby also for the dwindling intake of engineering students.

Therefore it is important that the number of specialised teachers is increased, in both primary and secondary schools within the fields of mathematics, physics and chemistry, and in this way also increases both the professional and pedagogical skills.

Experiments in some European countries have shown that more professional and attentive lessons in mathematics, physics and chemistry increase the student's interest in the engineering studies and the profession.

Better and updated teaching equipment and the development of new pedagogical teaching methods - for instance directed towards girls and skilled workers – would also be beneficial for the attraction of more students to the engineering profession. Investments are needed, and some of these can advantageously be made on a European level.

### **j. Targeted cooperation between schools and employers.**

One other way to make potential engineering students more open to the engineering profession is by an increased cooperation between both public and private employers and schools at both primary and secondary level. This should be a part of the employers "corporate social responsibility" as well as it seems to be an obvious part of their self-interest.

This would help visualising the many job and career opportunities for engineers, as well as it could help making mathematics, physics and chemistry more alive and relevant for boys and girls in primary and secondary schools. By involving employers and real problems and projects it becomes clear to the students, that mathematics, physics and chemistry is applicable to solving many of the problems society is facing today, and holds the keys to many new possibilities within fields like medicine, health care, transportation, pollution, durable energy, energy saving etc.

This kind of cooperation has to be nationally and locally based, but again, experiences and best practises have to be shared on a European level.

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