

**Appendix A to
*FEANI Position Paper***

Engineering Skills Shortage in Europe
How do we solve it?

approved by the FEANI General Assembly on 5 October 2007

Country specific reports about the shortage of engineering skills and what has been done to counter the national shortages.

It has not been possible for the working group to find statistical evidence about the existing engineering skills shortage on an overall European level, as well as it has not been possible to find forecasts about the future engineering labour market balance on a European level. Different actors have made some attempts.

For instance Institute for Employment Studies and Research Centre for Education and the Labour Market at the Maastricht University in 2001 made a report for the EU Commission with the title “Forecasting the Labour Markets for Research Scientists and Engineers in the European Union”. This publication was primarily an attempt to develop a methodology to make forecasts, but it has not been possible for the working group to track updated versions.

Also the OECD has made attempts to forecast the future supply of engineers in a global perspective. In May 2006 a working group launched the report “Evolution of Student Interest in Science and Technology Studies”, which was meant to be part of a global forecast about future lack of engineers and other technical scientists. But after this first report, the programme ran short of funding.

One of the problems in making these kinds of international situation reports and forecasts is of course that the term engineer is not internationally coherent and unequivocally defined.

On a national level though, several surveys, forecasts and analysis has been made and most national industrial policy and other authorities are very attentive to the topic. Situation reports from Germany, The Netherlands, France, Slovenia and Denmark are presented below, to show the existence and the character of the engineering skills shortage in Europe. The problems are basically the same in all European, although there are some differences in the current and future situation when it comes to extent and character of the shortages. These differences can basically be ascribed to differences in demography and other such country specific characteristics, which just lead to nonalignment of the phases in national developments in skills shortages – not to basic differences.

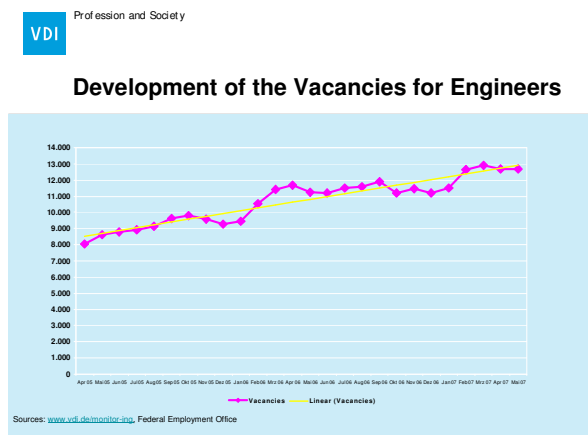
Situation of the Engineering Shortage in Germany

Antje Lienert M.A., VDI e.V.

A lack of available talent has become an industry-wide dilemma in Germany. With the positive economic development at the moment in our country, even the formally lesser required engineering professions as civil engineers or groups as older and female engineers are highly demanded. Due to the demographic change and a decreasing interest in engineering sciences, the lack of available talent will even get worse.

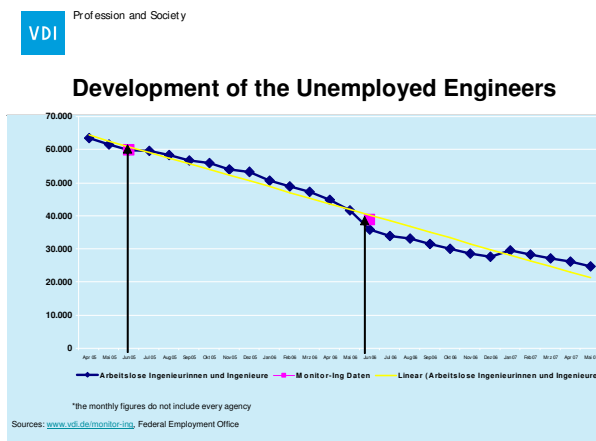
Vacancies for engineers

For many companies the single most important factor that restricts their growth is the shortage of qualified engineers. Looking at the figures of the federal employment office, the vacancies have increased for 50 percent in the last two years.



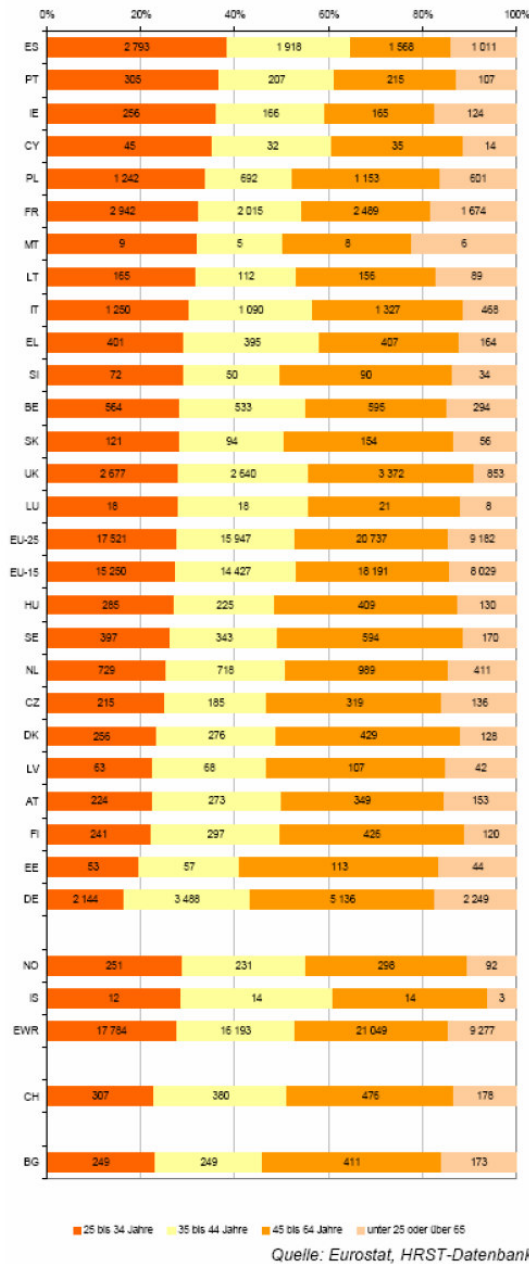
Unemployed engineers

The market demand on engineering skills can also be seen in the development of the unemployment rates. In the last two years the amount of unemployed engineers has reduced by sixty percent.



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German Particularities



Generally speaking, Germany has the same problems as (most of) the other European countries – but some of these challenges are affecting Germany even more. Concerning the female graduates, Germany has one of the last positions. Only 22 percent of the graduates in the fields of engineering sciences, production and construction are female.

In case of the age distribution of the human resources in science and technology Germany takes even the last position. In no other country are – compared to the other age classes – fewer young qualified personnel available.

Outlook

To solve some of these problems in the short range, Germany has to reconsider the immigration laws. On the long run we have to attract more engineers and more companies for the benefit of life long learning and other tools to keep the employability in good order. We cannot afford anymore, that many of our engineers are unemployed or leave the companies when they are only about fifty years old.

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Denmark

Summary

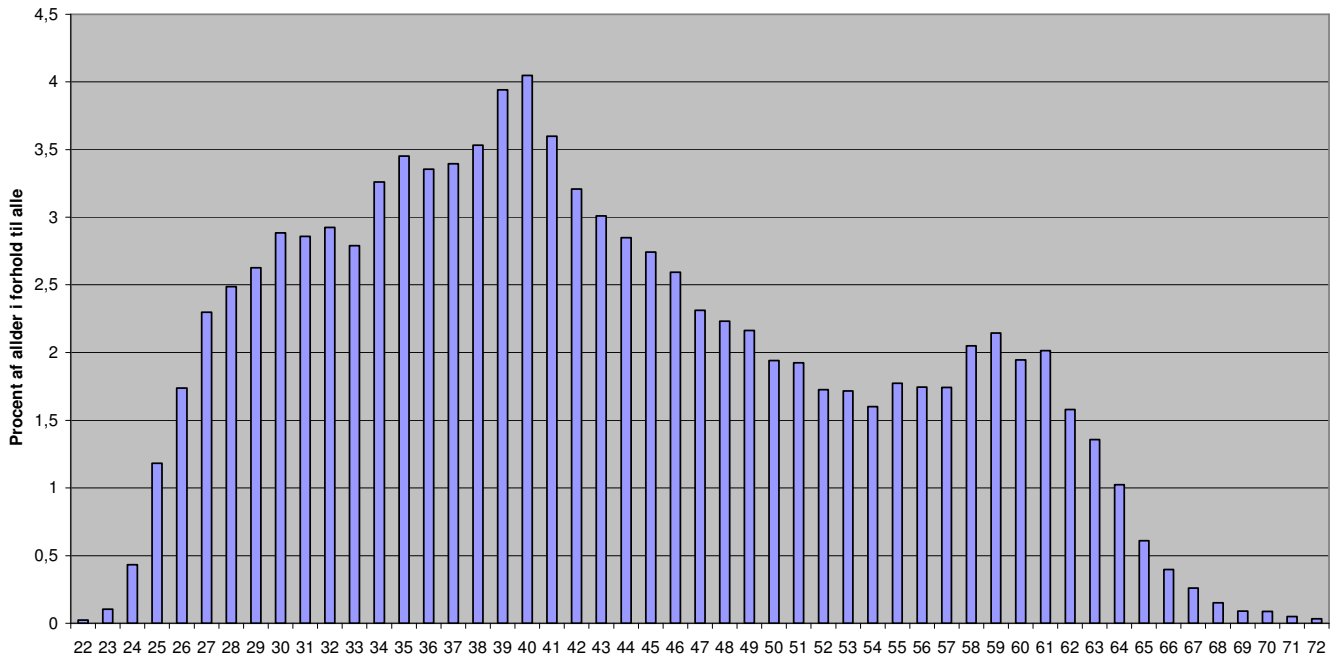
Currently there is a lack of engineers in Denmark and the problems for companies and the public sector will increase within the coming years due to demography, stagnation in number of students and increased demand for engineering skills – partly because of ambitious government programmes.

Since 2004 the unemployment rate for engineers in general has fallen from above 6% to below 2% in 2007. This can partly be ascribed to a rise in demand because of good performance by Danish industry and service providers but also to an insufficient supply of new engineers. The result is, that already today, both public and private employers cannot recruit engineers with some specific skills.

One reason for these so-called bottlenecks is stagnation in the number of students at the engineering studies. Since 1995 the number of students enrolling at the engineering studies has been very constant at around 2.600 persons.

Table 1. Age profile of employed engineers shown as a percentage of all employed engineers.

Aldersprofil erhvervsaktive ingeniører i DK



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This problem is well known to all developed countries, but so far the problem has not been devastating to Danish economy. But within the next 5 years a big group of engineers aged 56-61 will retire while the stagnation or reduction in the number of new entrants to the engineering labour market will continue as shown in Table 1. In parts of the public sector, this scenario is even worse, while app. 30% of all engineers will retire within the next 8-10 years.

Based on the age profile and on historic developments in demand and supply of engineers The Danish Society of Engineers (IDA) together with The Ministry of Science, Technology and Education in 2006, produced a forecast that showed, that in 2020 there will be a mismatch in supply and demand of engineers corresponding to 14.000 persons. Currently app. 70.000 engineers are working in Denmark.

The calculations above are made on a “ceteris paribus” assumption. As soon as the bottlenecks begin to show up, the preconditions will of course be changed, because the developments in companies and in the public sector will be altered. That the bottleneck already exists was shown in a survey carried out by IDA at the end of 2006.

A representative group of private companies employing engineers were asked about the recruitment situation on the engineering labour market. The survey showed among other things;

- 48% of companies had less engineers in their work force than needed
- 70% of companies with less skills than needed had not been able to recruit the right skills
- 42% of companies with less skills than needed had substituted with technicians and others
- 23% of companies with less engineers than needed had successfully recruited abroad
- 25% of companies did not expect they would be able to recruit the necessary number of engineers in 2007
- 60% of companies found that the shortage of engineers threatened company growth

The lack of engineers is already limiting the growth of Danish companies and thereby also Danish welfare. Some development programmes already decided by government to prepare Denmark for the challenges of “globalization” will worsen the situation. These programmes imply heavy investments in new technologies, better infrastructure, public service, renewable energy etc. All these programs lead to an increased demand for engineers, and thus worsen the above-mentioned scenario for 2020.

These problems are to some extent acknowledged by government and other relevant authorities. IDA has together with The Ministry of Science, Technology and Education and the employer organisations launched the programme “More and Better Engineers”. Government funds the programme and the aim is to increase juvenile’s awareness of the engineering profession and the interesting careers within this profession.

Slovenia

By Dusán Caf

Summary

Slovenia is facing a lack of highly qualified, skilled workers in the maths, science and technology fields, and the trends are worrying. The fast economic growth in 2006 and 2007 revealed that the skills shortage became one of the most important barriers that might hinder the future economic growth and development. The problem will increase due to negative demographic trends and stagnation of students. Changing values in society have also influenced a smaller interest in maths, science and technology studies.

Skills shortage endangers Slovenia's economic growth and development

In the first quarter of 2007, Slovenia's economy, fuelled by flourishing exports, domestic spending and investments, expanded at an annual rate of 7,2%. The fast economic growth, not surprisingly, indicated the structural worker shortage. In the second quarter of 2007, one third of companies in the manufacturing industry claimed they lacked skilled workers. Moreover, it was the highest skilled workforce shortage since the independence in 1991. It was more than 50% higher than at the same time in 2006 and three times higher than at the last economic growth peak in 1999. The worker shortage had increased slowly since mid nineties until 2006 when it grew faster than within the entire decade before. The same happened with the general worker shortage, where 15% of companies in the manufacturing industry reported the shortage. Although the demand was much smaller than for the skilled workforce, it also grew enormously as the shortage in the second quarter of 2007 was three times bigger than in the same period of 2006 (Source: Statistical Office of the Republic of Slovenia).

The skilled worker shortage has become one of the biggest obstacles in sustaining Slovenia's fast economic growth and development. The problem has been well known within the IT sector where companies have tried for years to attract skilled workers from South Eastern and Eastern Europe. As the legal immigration of professionals was not sufficient, some IT companies have been forced to establish branches in the countries of Western Balkans in order to employ local skilled workforce.

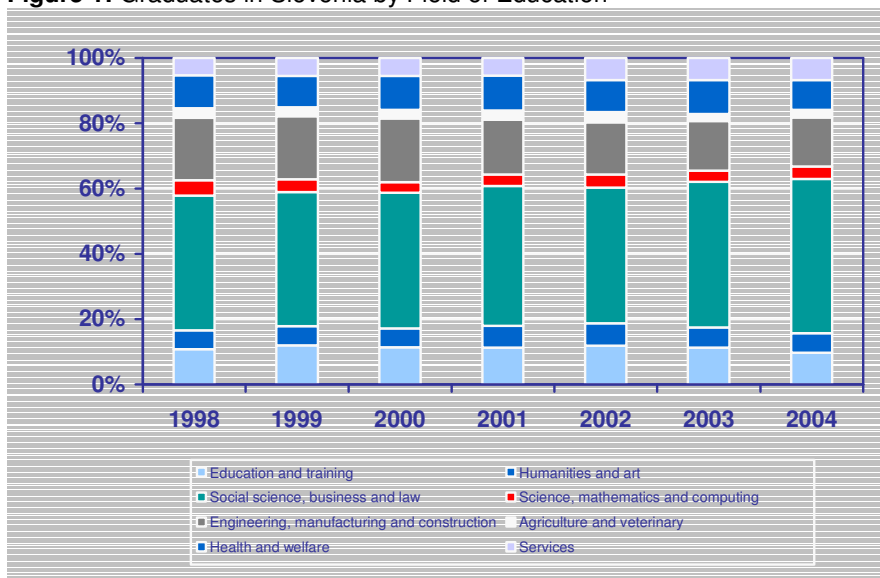
Recently, other sectors have also been facing the skilled worker shortage, especially amongst the engineers. As the manufacturing and civil engineering sectors are the main pillars of the current economic growth, the shortage of engineers might have a severe negative impact on their future performance. The number of workers employed in the civil engineering occupations grew 21% in 2006. The growth was also high in other engineering occupations (8% on average) and computer professionals (13%). As a result of increasing demand, the unemployment amongst engineers (6,4%) was lower than in the total workforce (11,1%), excluding self employed and farmers. Moreover, the lowest unemployment was in electrical engineering (2,8%), civil engineering (3,3%), and electronics and telecommunications (4,9%). (Sources: Statistical Office of the Republic of Slovenia; Employment Service of Slovenia)

Decreasing interest for math, science and technology education

The enrolment of students in the tertiary education reveals the educational structural gap in Slovenia that might endanger the country's future economic development. The number of all students enrolled in the tertiary education in Slovenia in the period between 1998 and 2004 grew 7,4% annually. The annual growth in the maths, science and technology tertiary education was 6,1% and decreased over the period to 3,7% in 2004. The compound annual growth in the same period was much smaller in the engineering tertiary education (4,7%) and over the period declined from 13,2% to 0,3%. On the other hand, the highest growth was recorded in the computing education, where the number of students grew 10,8% annually and the growth was 16,5% in 2004.

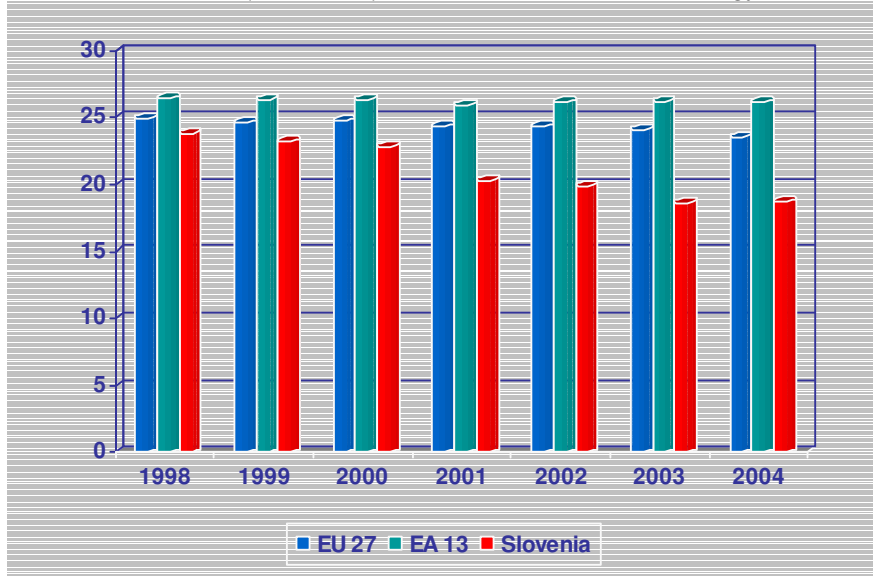
The structural changes are clearly seen from the figures on graduates by the education field in the period between 1998 and 2004 (Figure 1). The share of engineering, manufacturing and construction graduates in the tertiary education graduates decreased from 19,1% in 1998 to 15% in 2004 (12,6% in 2006). Moreover, the share of math, science and technology graduates, which decreased from 23,8% in 1998 to 18,7% in 2004 (16,2% in 2006) was significantly smaller than in the EU-27 or EA-13 (Figure 2).

Figure 1: Graduates in Slovenia by Field of Education



Source: Eurostat.

Figure 2: Graduates (ISCED 5-6) in maths, science and technology fields - as % of all fields



Notes: Technology means computing, engineering, manufacturing, construction;
Source: Eurostat.

EA means Euro Area.

The engineering education and professions in Slovenia have become less attractive, although the major contributing sectors to the GDP and economic growth are still those depending on the engineering skills. However, due to the structural changes in the Slovenian economy on the one hand and much deeper changes in values in society on the other hand since independence in 1991, the most preferred studies have become those in the field of social science, business and law. The maths, science and technology studies have been less and less popular. Even more so, as they have a stigma of being difficult studies.

Once highly respected engineering professions have lost their esteem also because of relatively low salaries compared to some other professions in the health and public administration sectors. The unions representing doctors, lawyer and public administration occupations are very strong and have secured high salaries for their members. On the other hand, engineers are not so well organised and do not have any engineering union. Salaries of engineers may therefore vary significantly and depend on the industry sector. However, the average salary is significantly lower than in comparable professions in the public sector. A comparison of data on graduates and employment confirms that maths, science and technology professions are becoming less attractive, as more and more graduates later work in other professions, especially in sales, marketing, management and public administration.

Lack of active policies to tackle a skills shortage problem

Slovenia opened the labour market by joining the EU. The immigration trends have been positive, yet not sufficient to compensate for the lack of domestic workforce. Unfortunately, only a small share of immigrants represents the skilled workforce. Slovenia does not have any active policy of attracting skilled workforce, although there have been several initiatives, especially within the IT industry. On the other hand, there is relatively high immigration of less qualified workforce, especially in the civil engineering sector and for season jobs.

Lower salaries than in more developed EU member states and high taxes retreat highly skilled workforce from abroad. There have been several initiatives to lower taxes, but the Government has not made any significant changes. The macroeconomic environment remains less attractive than in some other EU member states. The Government is aware that the lack of engineers is becoming a serious barrier for industry to secure its future growth, but has yet to take any decisive action to improve the situation.

Outlook

Both, companies and the public sector will face the engineering skills shortage in the coming years. The supply of new engineers will decrease due to negative demographic trends and stagnation of students. Slovenia has to reconsider its policies to increase the number of highly qualified, skilled workers, especially engineers. It will have to take proactive steps in the education policy and promotion of engineering skills. Policies and actions are also required to provide better training and qualifications for engineers, as well as lifelong learning to keep them employable.

Changes are required in the fiscal policy in order to reduce the taxation of salaries and make the country competitive to attract the best human resources from abroad. The changes are also required in the immigration policy to attract more engineers and other highly qualified, skilled workers as Slovenia cannot secure its future growth on its own resources.

Slovenian engineers will have to be proactive, too. They should follow examples of countries like Denmark or Germany and build strong engineering associations to promote their professions.

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