



1st European Conference on Gender and Diversity in Engineering and Science



TEE

fib

**‘Investigation of the causes for the low attraction
of female students in engineering careers’**

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Greek Women’s Engineering Association (EDEM)



Greek Women's Engineering Association (EDEM)



- EDEM established in 1997
- Members: Qualified Greek Women Engineers (members of the Technical Chamber of Greece)
- Members ~1500
- Women engineers in Greece ~14000
- EDEM works in parallel and additionally with Technical Chamber of Greece (TEE) for the amelioration of the work conditions of engineers in Greece (technical laws, salaries, insurance, unemployment ect) and especially for the issues concerning women engineers (lower salaries, lack of opportunities, lack of social support, glass ceiling etc).



Introduction

Results & conclusions of the project
CREATING CULTURES OF SUCCESS FOR WOMEN
ENGINEERS

*5th FP, Specific Programme “Improving the Human Research
Potential and the Socio Economic Knowledge Base”*
A Project Funded by the European Commission, 5th FP,
HPSE-CT-2002-00109,
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Womeng Project Collaborators

Austria

**Institute for Interdisciplinary Studies of Austrian Universities
(IFF/IFZ)**

Finland

Witec Finland Ry, Tampere

France

**Conference of Heads of Engineering Schools of France (CDEFI)
Ecole Nationale Supérieure des Arts et Métiers (ENSAM – Paris)
Institut National des Sciences Appliquées (INSA – Lyon)**

Germany

Bergische Universität GH Wuppertal

Greece

The Greek Women's Engineering Association (EDEM)

Slovak Republic

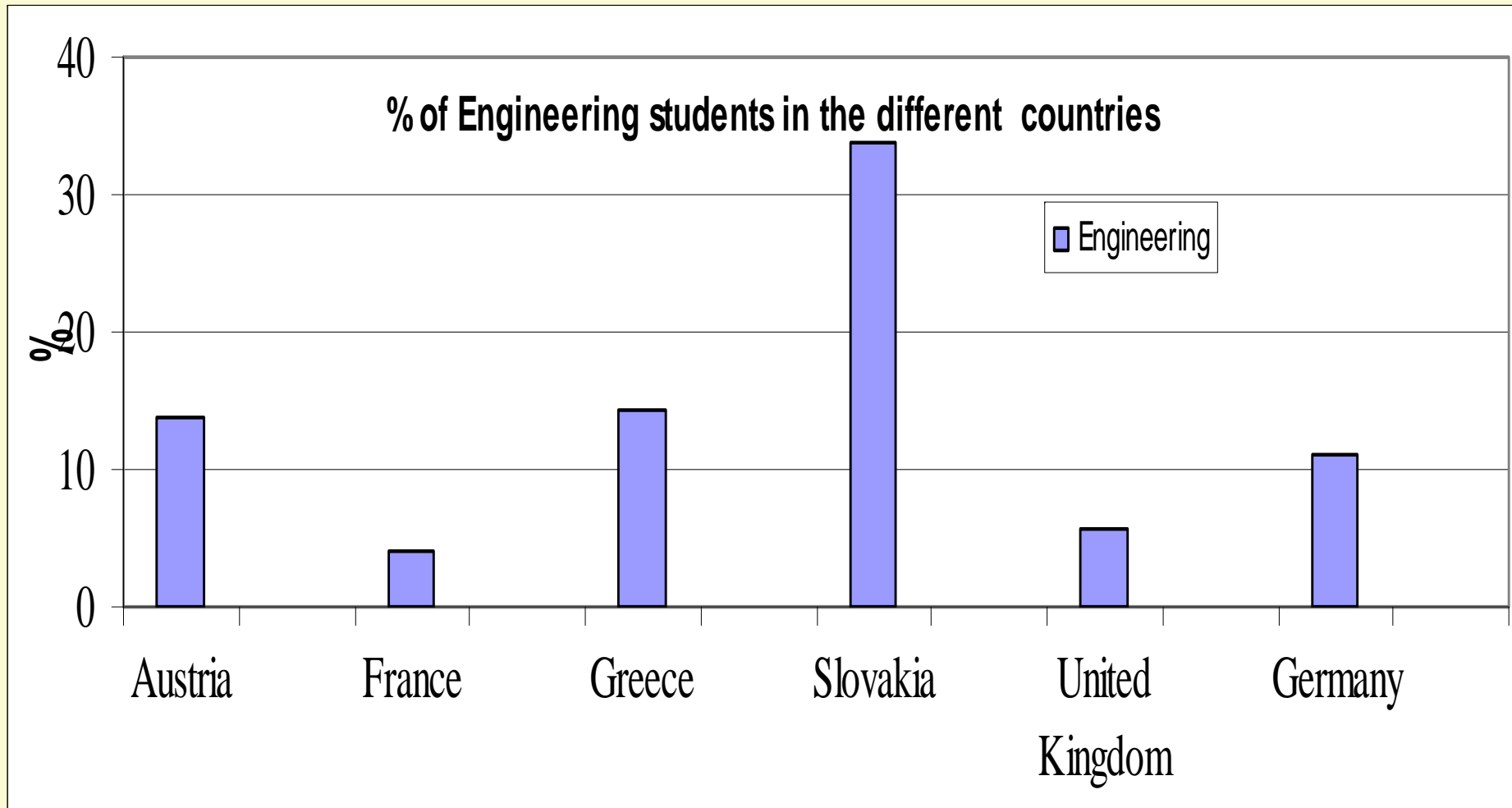
Faculty of Economics, Technical University of Kosice

United Kingdom

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Engineering field & technical sector are the funding of a strong economy for countries and for successful carriers and high income for professionals





Methodology

Research strategy :Comparison

- Reasons of choice
- Success- Non persistence
- Organisational culture & social change

Sampling philosophy:

- The same questionnaires for all countries
- Larger sampling where women are minority
- Study reasons for not having chosen engineering



Questionnaires sampling by country (1)

Country	Q1: 100 questionnaires to engineering students (goal: 50 men and 50 women)	Q2: 100 questionnaires to students who could have chosen engineering, but did not (goal: 50 men and 50 women)
Austria	<ul style="list-style-type: none"> - Graz University of Technology: Electrical Engineering, Chemical Engineering - Vienna University of Technology: Electrical Engineering, Chemical Engineering - University of Linz: Informatics 	<ul style="list-style-type: none"> - University of Graz: Natural Sciences, Social and Human Sciences, Economics - University of Vienna: Natural Sciences, Social and Human Sciences - University of Linz: Economics
Finland	<ul style="list-style-type: none"> - University of Oulu - University of Helsinki - University of Tampere, - University of Jyväskylä <p>Students from environmental eng., mechanical eng., process eng., electrical eng., industrial and management eng., information and knowledge management, chemical technology.</p>	<ul style="list-style-type: none"> - University of Oulu: Humanities, education, Science, Medicine, Economics, Business Administration - University of Tampere: Municipal government, languages, Social Science, Medicine, Information - University of Jyväskylä: history, media, communication
France	<ul style="list-style-type: none"> - ENSAM in Paris: generalist training in engineering with emphasis on mechanics, Paris - Centrale-Lyon: generalist training in engineering - INSA-Lyon: electrical eng., civil eng. - Université de Technologie de Troyes: various specialities in engineering - ENSCP in Paris: chemical engineering 	<ul style="list-style-type: none"> - students in social sciences (prep. class. Lycée du Parc, Lyon) - students in business and management (prep. class. Lycée du Parc, Lyon) - University of medicine (Lyon 1)



Questionnaires sampling by country (2)

Country	Q1: 100 questionnaires to engineering students (goal: 50 men and 50 women)	Q2: 100 questionnaires to students who could have chosen engineering, but did not (goal: 50 men and 50 women)
Germany	<ul style="list-style-type: none"> -Technical University of Berlin, mechanical eng., civil eng. -Technical University of Aachen, mechanical eng., civil eng. -University of Wuppertal: civil eng. -Technical University of Applied Sciences, Berlin: mechanical eng. -University of Applied Sciences, Stralsund: industrial eng. (co-ed. And mono-ed.) 	<ul style="list-style-type: none"> -Technical University of Berlin, sociology -Technical University of Aachen, chemistry -University of Wuppertal: Economics, social sciences, physics -Technical University of Applied Sciences, Berlin: Economics
Greece	<ul style="list-style-type: none"> -National Technical University of Athens: chemical eng., civil eng., mechanical, electrical and computer eng. -Technical University of Patras: chemical eng., civil eng., mechanical, electrical and computer eng. 	<ul style="list-style-type: none"> -Panteion University: human and social sciences -Athens University of Economics and Business, University of Piraeus: Economics -National and Kapodistrian University of Athens: Natural Sciences
Slovakia	<ul style="list-style-type: none"> -Technical university of Kosice: electrical eng., informatics, civil eng., mining, ecology, process control, geotechnologies -Slovak University of Technology in Bratislava: electrical eng. And information technology -Technical university of Zilina, civil eng. 	<ul style="list-style-type: none"> -Technical university of Kosice: Economics -Matej Bel University in Banska Bystrica: Economics, natural sciences, education -Safarik University in Kosice: natural sciences -University of Presov, education
UK	<ul style="list-style-type: none"> -Glasgow University: mechanical, civil -Strathclyde University: mechanical, electrical, chemical, civil, interdisciplinary mechanical -Napier University Edinburgh: computing engineering -Heriot-Watt University: mechanical, electrical, chemical, civil 	<ul style="list-style-type: none"> -Glasgow University: computing science, physics, business -Strathclyde University: computing science, physics, business -Napier University Edinburgh: computing science -Heriot-Watt University



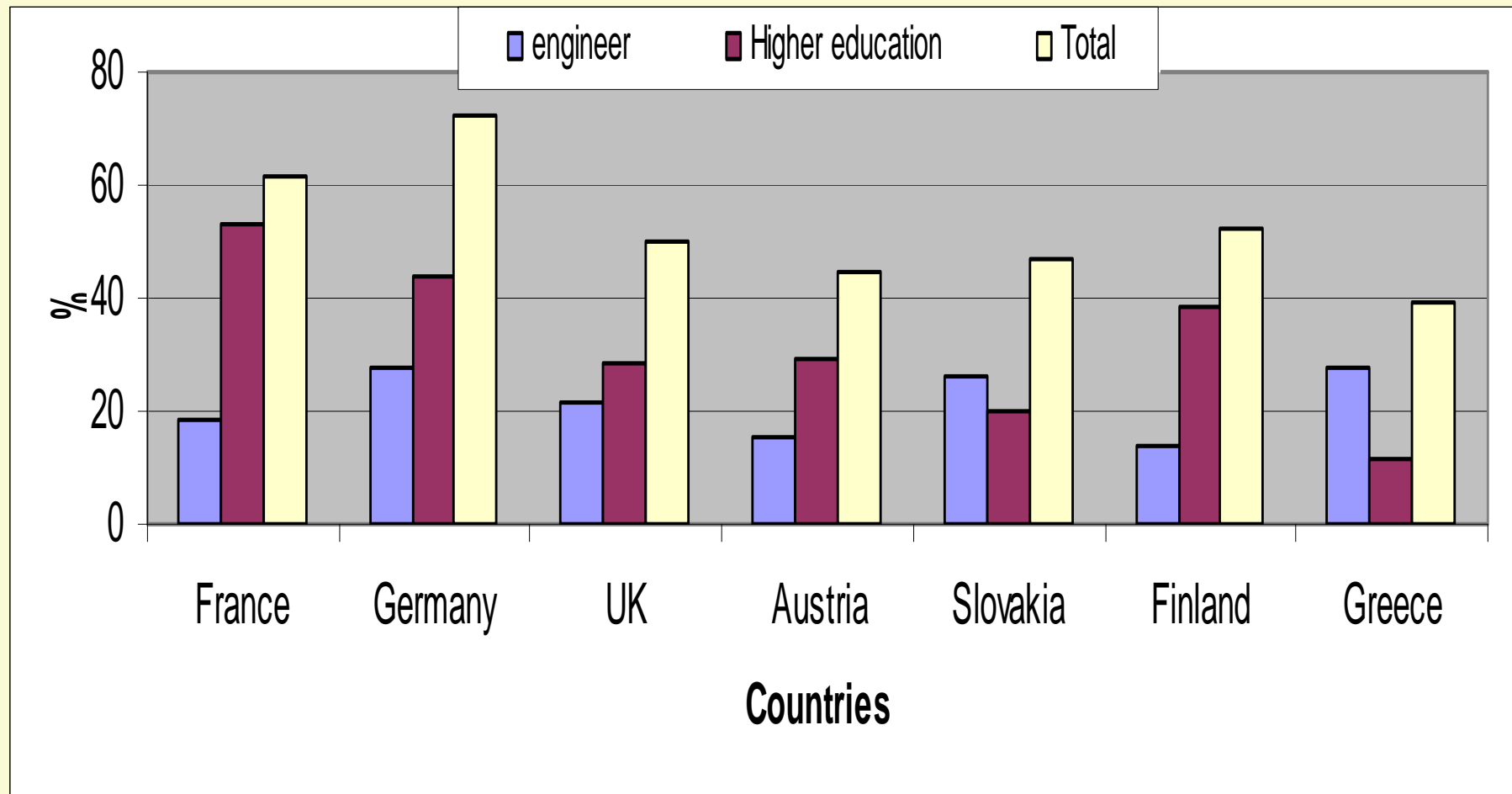
Questionnaires sampling by country (3)

(Aim: 200 questionnaires/country)

Country	Q1 from which:			Q2 from which:		
	males	females	total	males	Females	total
Austria	45	34	79	55	58	113
Finland	71	59	130	28	86	114
France	53	53	106	33	40	73
Germany	50	50	100	51	49	100
Greece	40	40	80	32	32	64
Slovakia	49	49	98	51	49	100
United Kingdom	56	50	106	32	41	73
Total	364	335	699	282	355	637

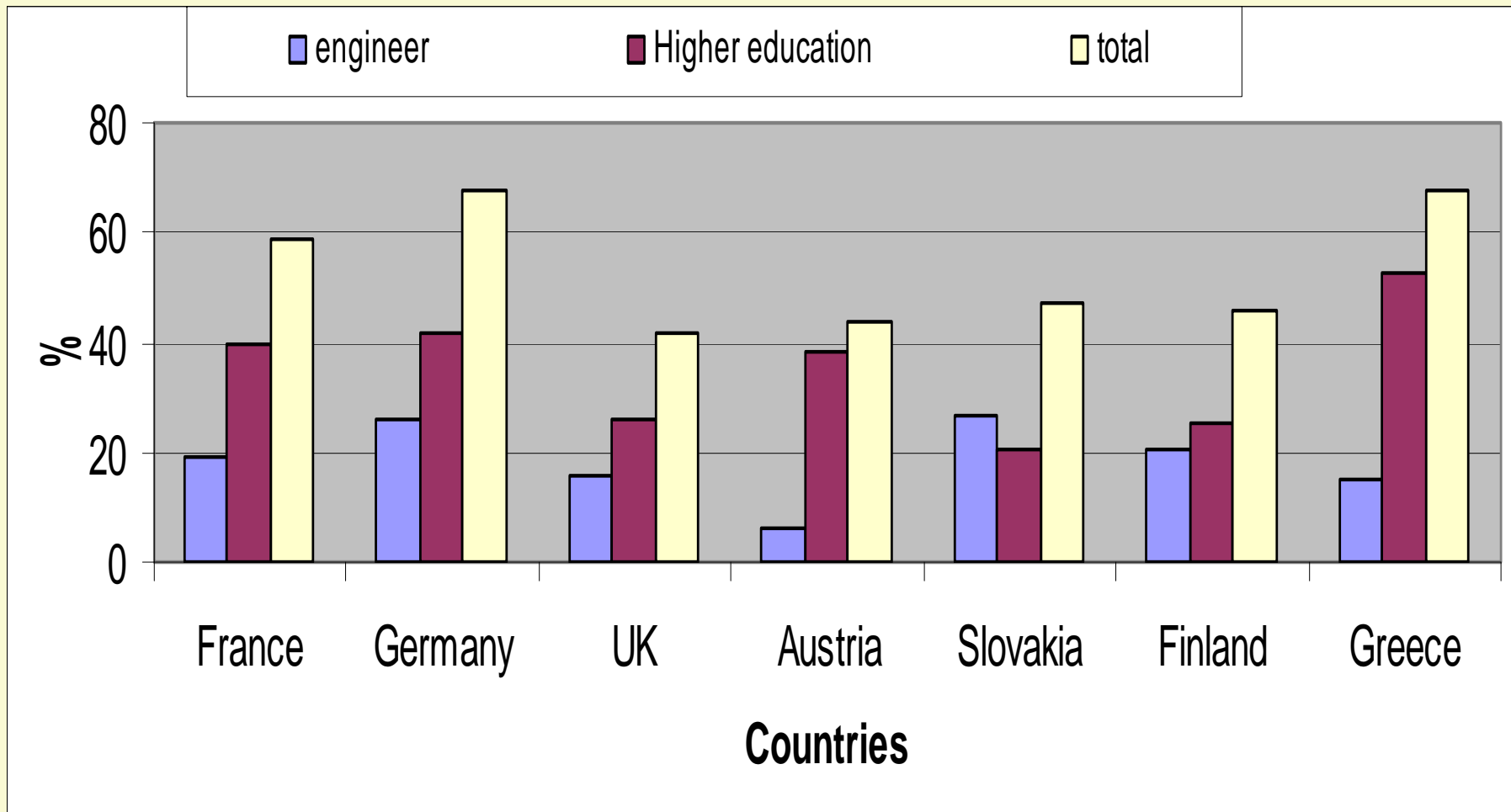


Education of the parents for men engineering students: Fathers



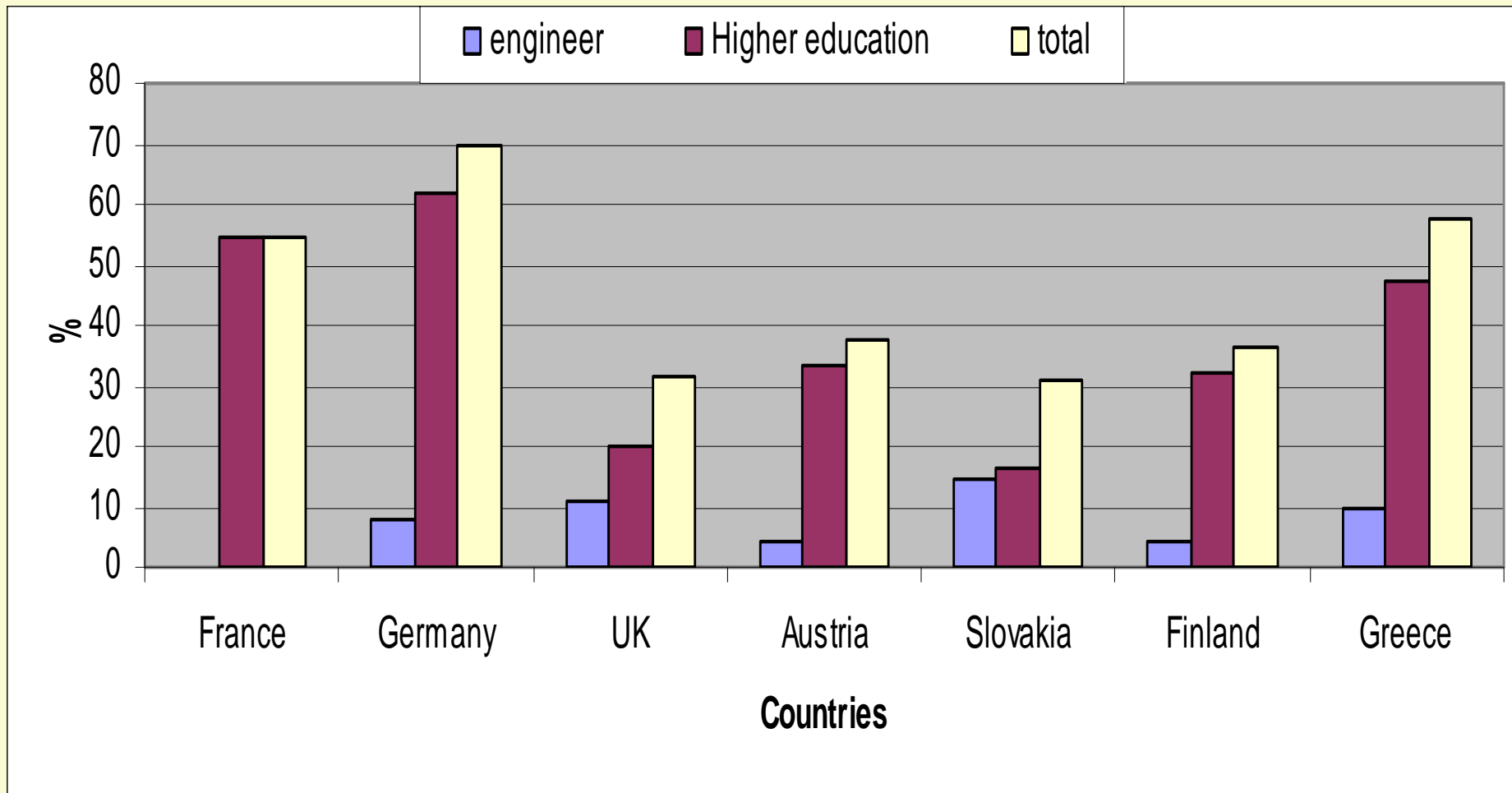


Education of the parents for women engineering students: Fathers



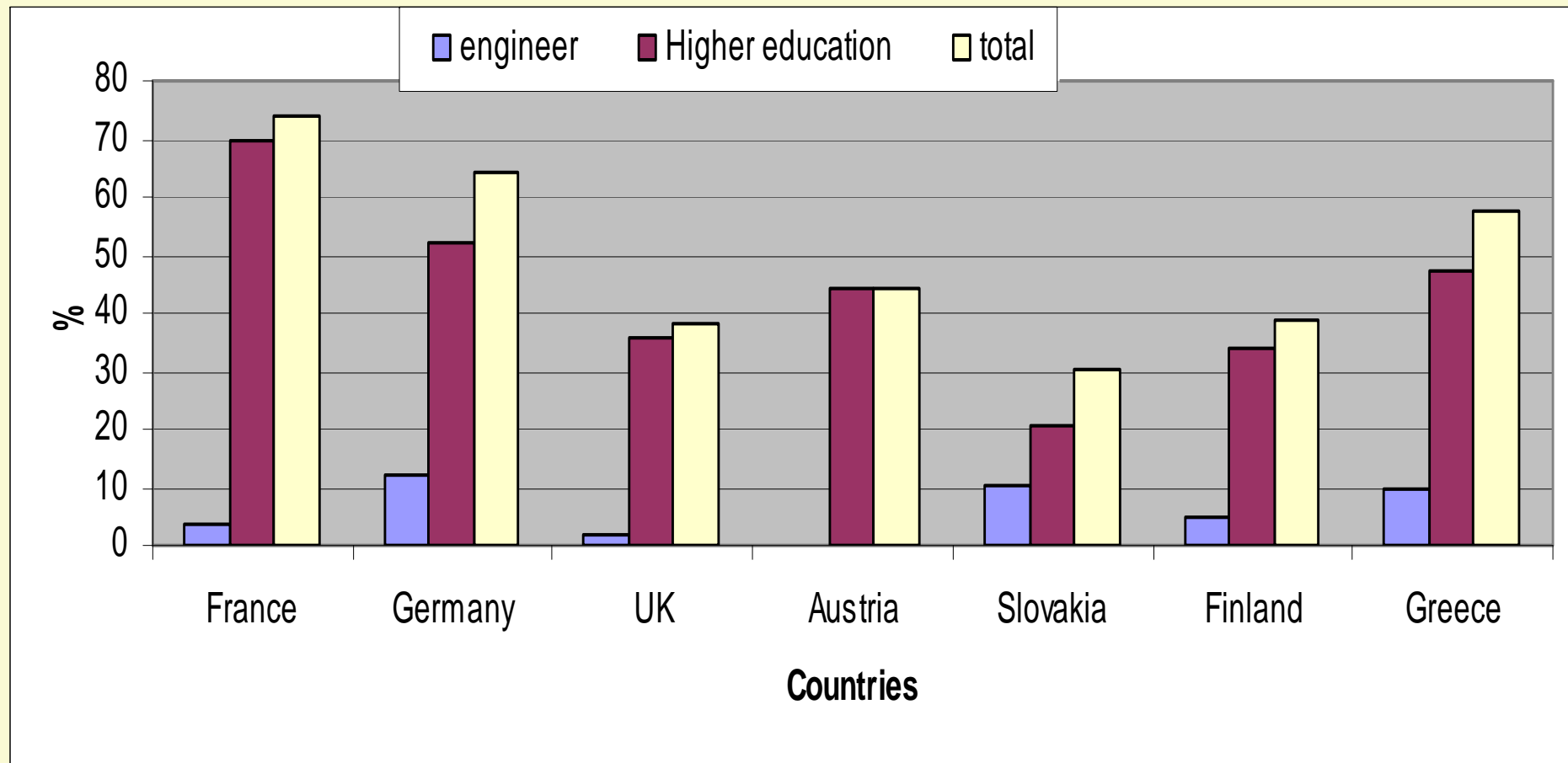


Education of the parents for men engineering students: Mothers





Education of the parents for women engineering students: mothers





Is it likely that you will be working in a technological related field in seven years from now?

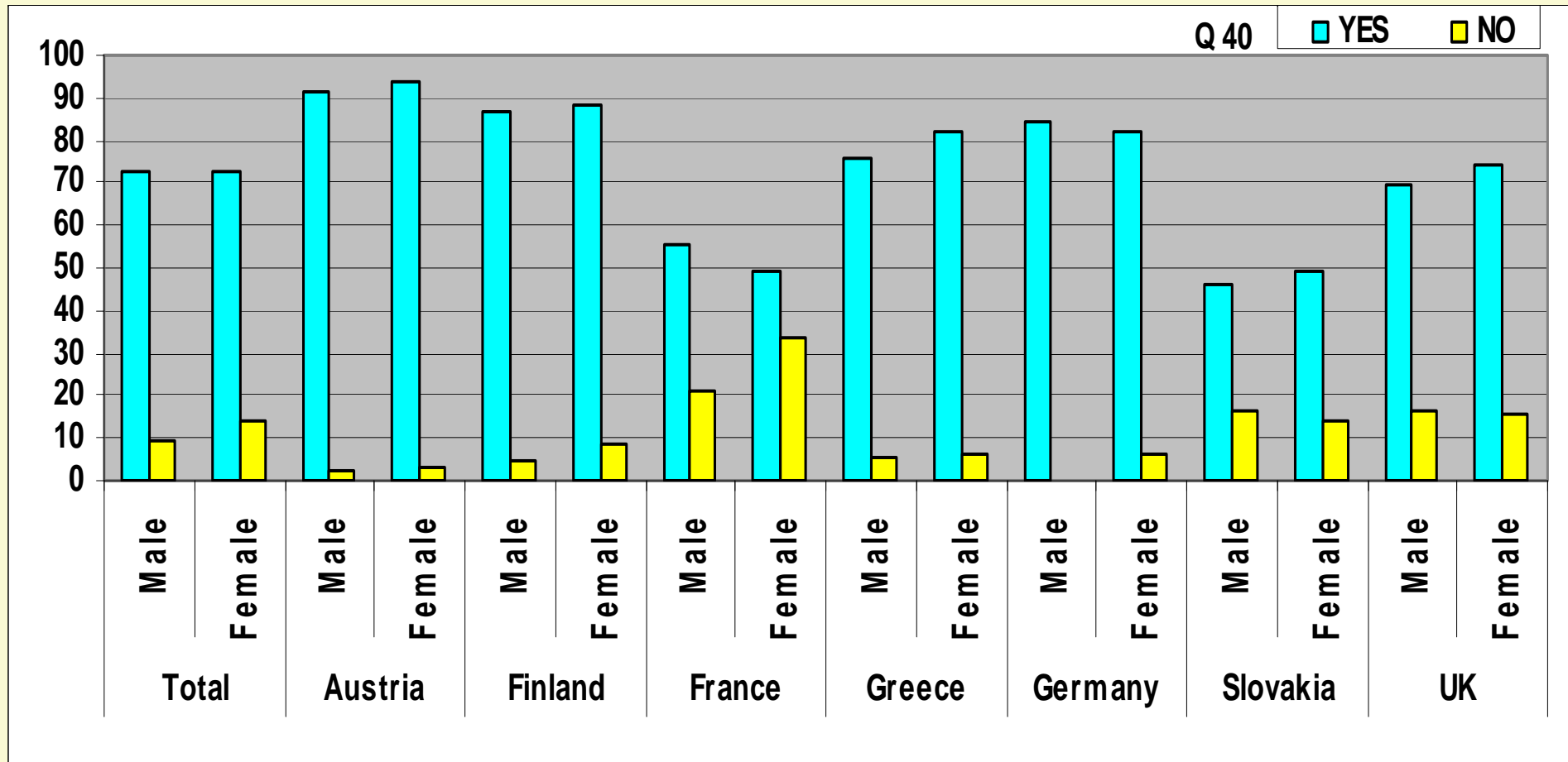
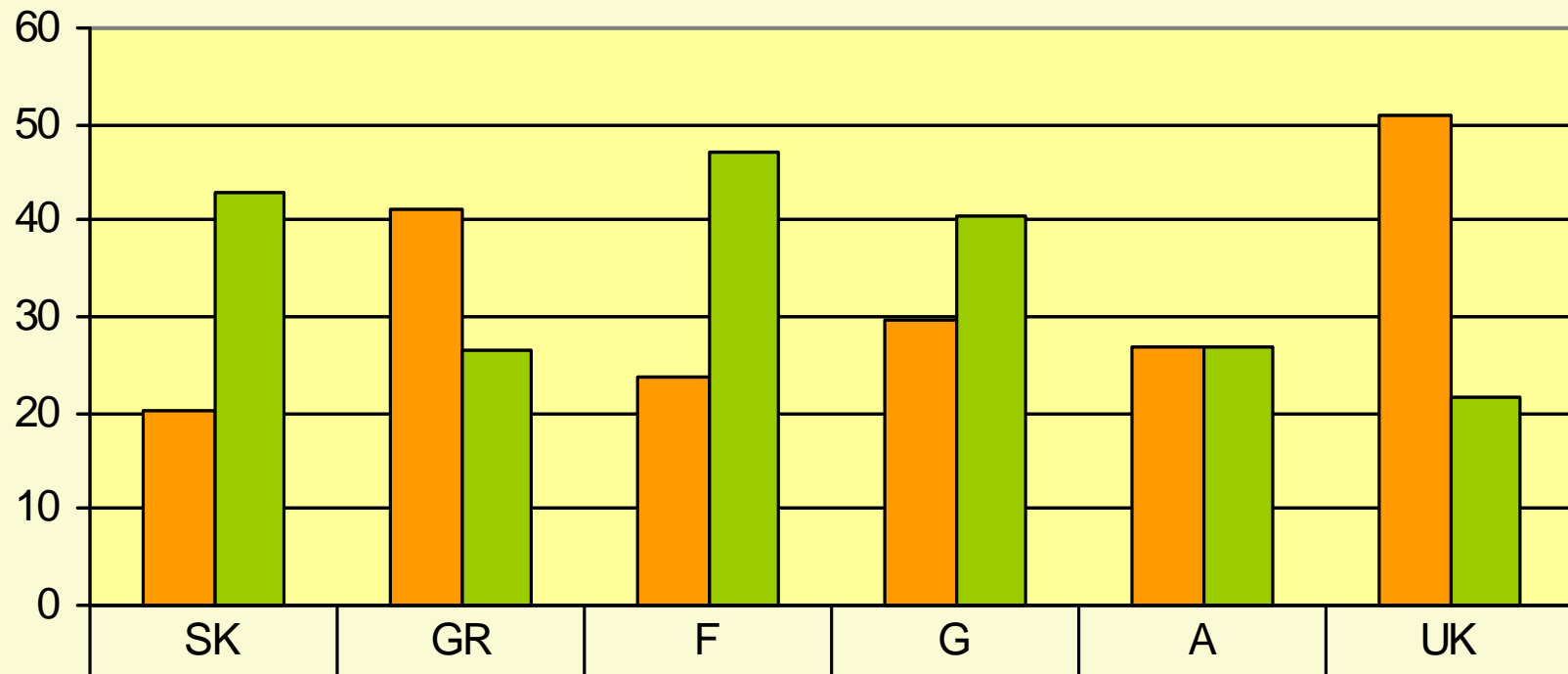




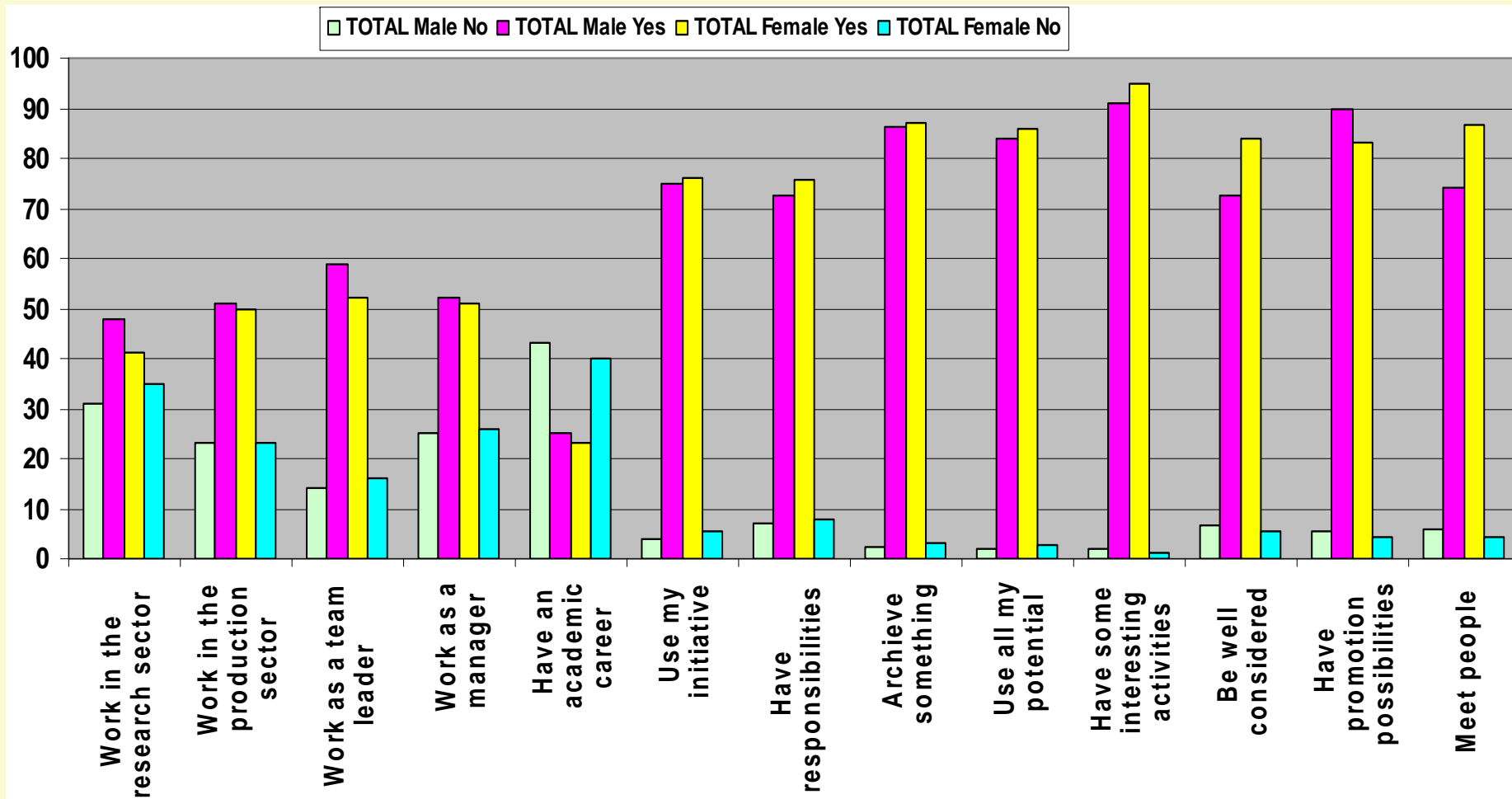
Image of femininity fitting with the image of a female engineer (answers of male engineering students (in %))



1+2 rejection	20,4	41,2	23,8	29,8	26,9	51
4+5 consent	42,8	26,4	47,2	40,4	26,8	21,7

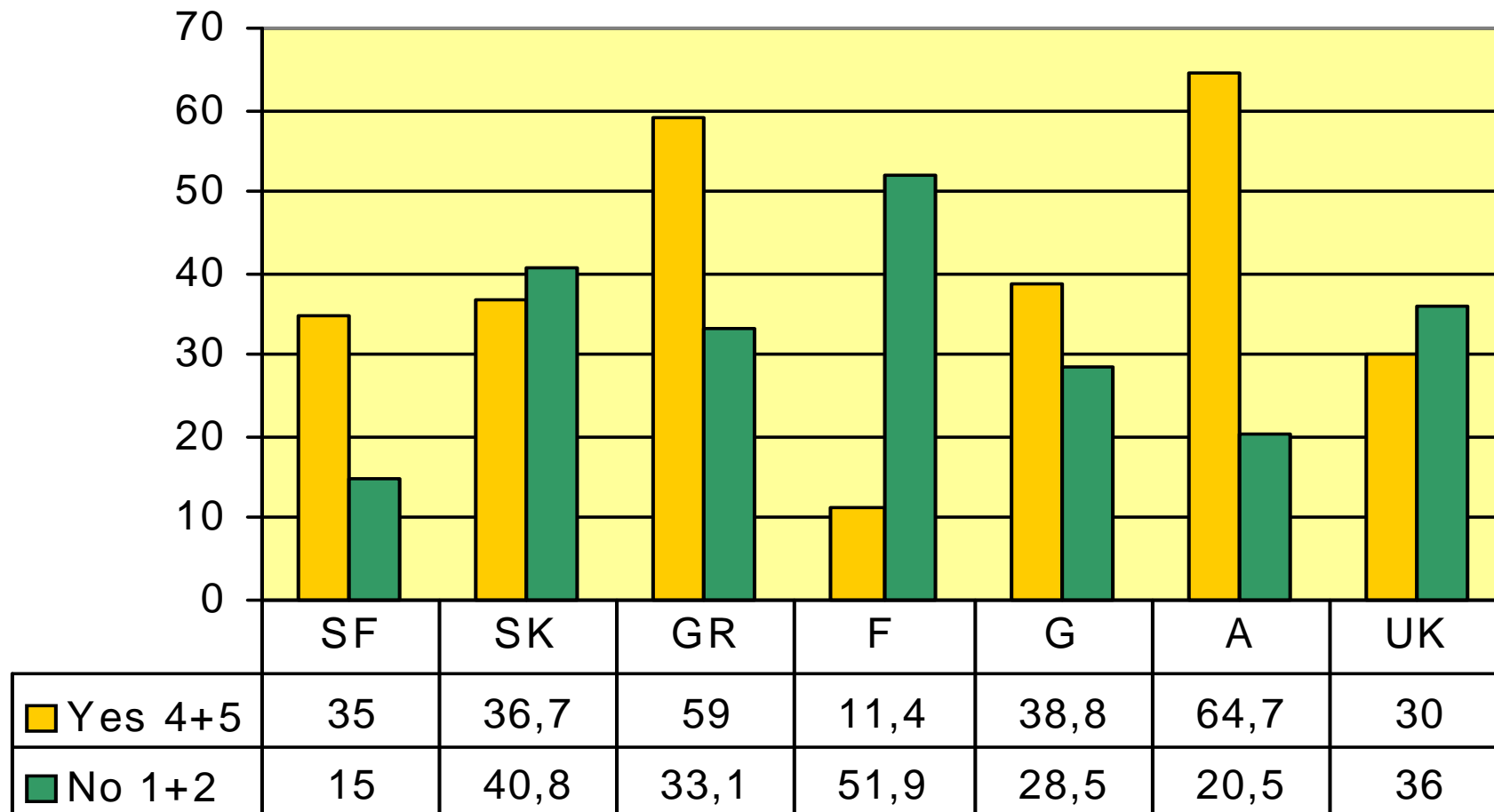


As an engineer you would like to:



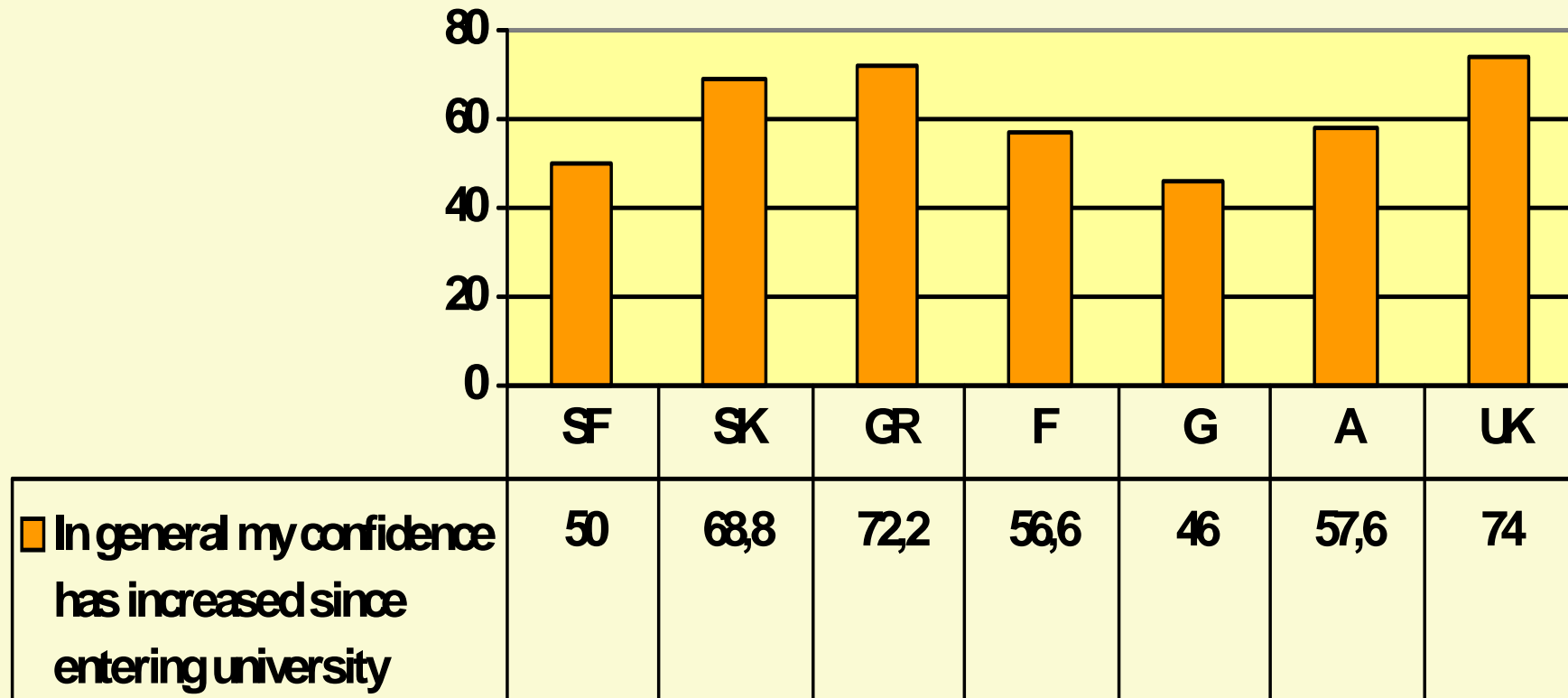


Request for non-technical subjects (answers of female engineering students)





Self-assessment concerning confidence - answers of female engineering students





Conclusions (students)

The decision of girls about choosing their studies and carrier orientation depends (in some countries less in others much more) on their family environment and their society stereotypes.

Women students in engineering are in no way different from men: they basically expect the same things from their professional life, they have the same degree of involvement in their studies, they have the same ambition, the same objectives, the same interest for the jobs and the careers offered by their diploma.

They are more interesting in the social impact of technical decisions of engineers, in the environment issues and they want their studies to deal with these objects.

They are just a little more aware that the balance between personal and professional life may be difficult to achieve!



Advice to female students

- **Young employees should be aware of the big influence of networks. Experienced women engineers would recommend female engineering students already during study time to get work placements in big companies to get the experience of working conditions and to become a member of the internal company network. So the chances of getting a job after graduation would increase, although it is not always easy to get a job.**
- **Women engineers all over Europe agreed on needing more visible female role models.**
- **Mentoring of young women by successful women in the the same field.**



Working environment statistics –1 (Eurostat)

Unemployment Rate (2004)

European Union	Men	Women
15 Countries	7.1 %	9.3 %
25 Countries	8.1 %	10.2 %

Gender pay gap

Countries	2000
Austria	20
Finland	17
France	13
Germany	21
Greece	15
Slovakia	22
United Kingdom	21



Working environment statistics –2 (Eurostat)

Part-time employment as percent of the total employment of a given sex (%)

Countries	Total	Women
	2000	2000
Finland	12,7	17,5
France	16,9	31,0
Germany		
Greece	4,7	8,1
Slovakia	2,1	3,1
United Kingdom	24,8	44,4

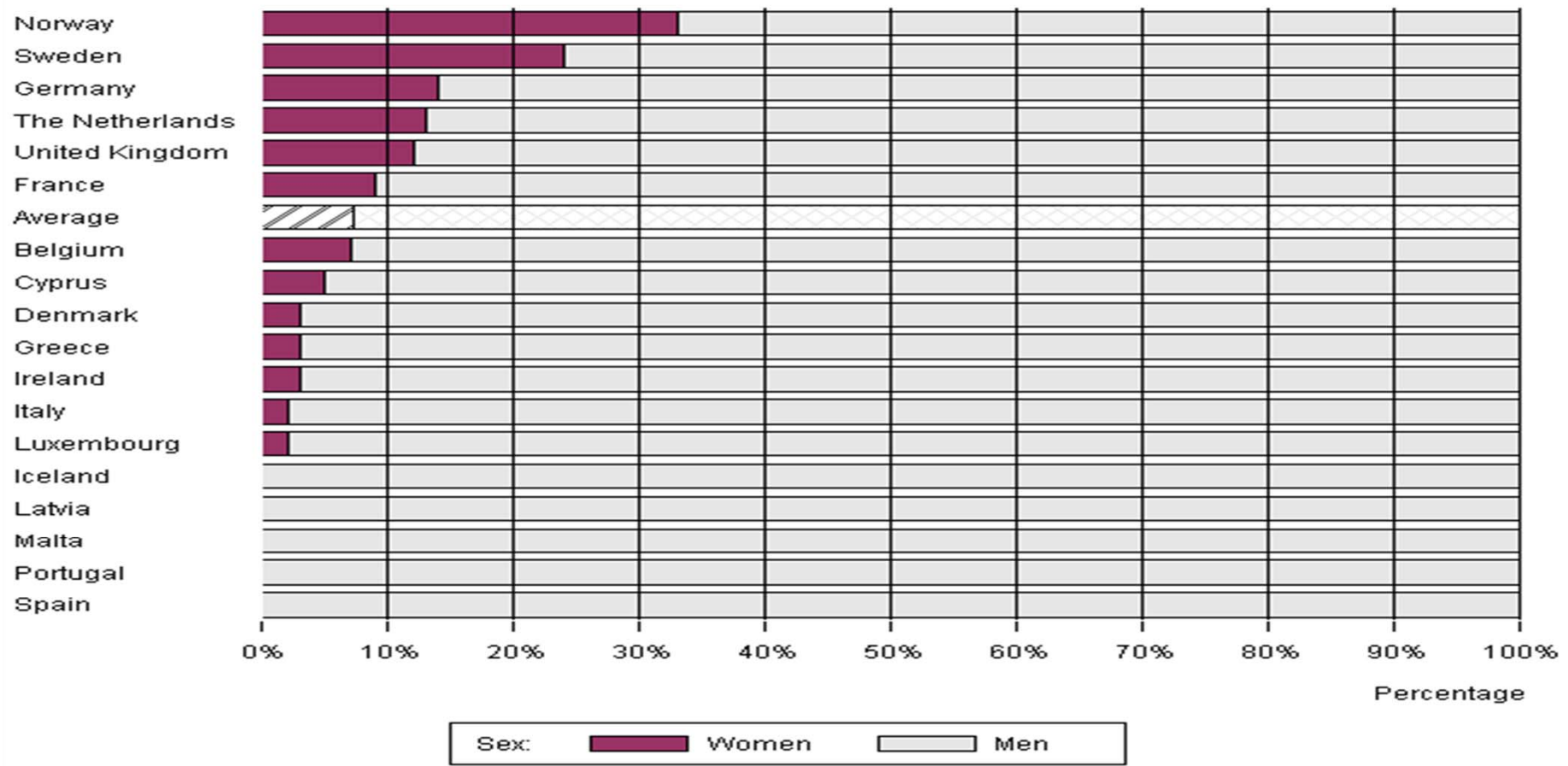
Fecundity rate

Europe (25) : average in 2003	1,48
Austria	1,39
France	1,89
Finland	1,76
Germany	1,34
Greece	1,27
Slovakia	1,17
UK	1,71
USA	2,07



Presidents and members of the highest decision-making body in Top50 companies

Presidents and members of the highest decision-making body in Top50 companies in NACE sectors L-O





Stereotypes (1)

Managers:

- “Women do not want to commit and have a career.”*,
- “Women will get pregnant and stay away for two or three years.”*,
- “Women as mothers are not good at work.”*,
- “Women have no leadership qualities.”*,
- “Women are not good at engineering.”*

- **Women in non-traditional professions are confronted with a variety of barriers. This is true for engineers, scientists and technical professionals in a broader sense. After having successfully negotiated the cliffs of technical training and education they are confronted with heavy storms on the sea of the job market. The interview partners no longer used the pseudo-argument “A woman could become pregnant.” However, the so-called “clonal effect” and the “pressure to reproduce homo-social and homo-sexual structures of management” are still prevalent in company hiring practices.**



Stereotypes (2)

Decisions in favour of a woman will still only be made hesitantly even if she is better qualified than the men who apply. Whoever chooses a woman has to justify his or her decision even more strongly. Female Human Resources managers are in a similar situation to their male colleagues and sometimes it is even more stressful. They may react even more severely since they are observed more closely and face higher pressure to legitimise their decisions.

They described their professional lives in science and engineering as an ongoing hurdle race. They feel trapped in a status of “permanent beginners”. They have to prove anew their competence every day. Whereas male engineers are perceived as competent from the start, such confidence is not placed in women in advance.

Even highly qualified women engineers feel they have to work harder than their male colleagues to get the same recognition and appreciation. They have to convince their colleagues that “being female” and “being technically competent” is not an oxymoron or a contradiction in terms.



Sterotypes (3)

- **As in engineering, women in leadership positions are also often seen ambivalently. On the one hand, women are accused of not wanting to take charge and of not being confident enough to take on executive functions in management.**
- **On the other hand, women who do want the responsibility are at the same time not seen as competent or as possessing the leadership qualities desired and do not receive the necessary acceptance.**
- **Things might not work out properly if a woman was responsible and the person who entrusted the woman with that job could be criticised along the lines of, “*Why did you give a woman that responsibility?!*”**



Work atmosphere (1)

- **Unsupportive:** difficult to have ideas accepted; unequal access to training, to interesting jobs; lack of company back-up for one engineer when she had problems with subcontractors on site,
- **Male-dominated** but women should adapt and make allowances for men! (Austrian woman engineer),
- **Lower paid** (for more responsibility even if better qualified; may not be able to afford the woman in a few years time if she is paid more now),
- **Sexist:** advantageous to work in such a company “*As we are less numerous, we are pampered*” (French women engineers). Women perceived as less competent due to quota system; equal expectations on paper but ‘*women have to be able to work as well as men*’;



Work atmosphere (2)

- **Competitive:** women competing to show they are as well-qualified and as able as the men; warrior-style management with harsh language,
- **Competence questioned** due to inherent sexism; but once competence shown it is no longer questioned in some countries, in others it continues to be questioned
- **Commitment questioned** if women work part-time, especially in a prevailing culture of presenteeism. Also they have to prove their competence over again each time there is a change of line manager.
- One Austrian engineer suggested that it is unassertive women who tend to leave engineering. A French HR manager commented that a bad atmosphere might deter women from engineering but we need to ask ourselves if these are acceptable working conditions for male engineers.



Work atmosphere (3)

- The key thing here is that the general approach to the problems or failures caused by women and men is different in some countries. If a woman *'spoils something'* the reaction is usually *“Well, she’s just a woman, what else could we expect from her”* (male engineers of female engineers in Slovakia when something goes wrong).
- and if it’s a problem caused by a man, *“It could happen to anybody”* (male engineers of male engineers in Slovakia when something goes wrong).
- Several women reported having problems with older men (dinosaurs) who could not accept that young women could be better qualified than they were, although women in Austria also found difficulties with male engineers of the same level. In general they find it easier to work with male colleagues of lower ranks. Others commented that the expectations of women are higher and the mistakes made by women are not overlooked. *“Her mistakes were always presented more openly than the men’s mistakes”*



Work atmosphere (4)

•“Okay my dear, you say whatever you like and then we solve the problem in our way”

- **Lack of respect (which can be ‘institutional’ or individual) can also cause problems in work relations and job expectations. Some Slovak engineers found women were tolerated but not accepted at the company. The company management did not expect much from women and they had no chance for further education. They were generally given simple, unchallenging jobs. Men were those who were supposed to climb the career ladder and women were there to finish those great jobs that were started by men. Others found they were patronised by male colleagues.**
- **Women engineers in several countries have reported being mistaken for a secretary and one (UK) said she was often treated with more respect when they found out she was an engineer.**



Work atmosphere (5)

- It is encouraging to see that most women in most countries have spoken of experiencing good working relationships and a good work atmosphere.
- However, we must bear in mind what the President of the Women's Engineering Society said:

‘In the UK about 80% of engineers are employed in small to medium-sized companies. The reality of their work relationships and their work culture might be very different from the situation in large companies, particularly in multinationals. In other words, the overall picture in each country may be worse than the picture we are painting. This does not prevent us from drawing conclusions and making recommendations based on the information we have received, and this should be able to make a positive difference in any company where these recommendations are applied.’



Problems in working life

“We don’t want to be looked upon as assisted people or treated like children”

“A woman never has the same support from her husband as the other way around. Men always get compliments for doing housework, things which are normal for women.”

“Mobility promotes promotions. And when you reach a specific age, offers correspond less to your competence and experience: there is a stagnation of the careers of women who have reached a certain age. You have to play the mobility game”

- **Balancing private and professional life**
- **Dual careers**
- **Promotion and mobility**



Reasons for glass ceiling

Historical & social reasons:

- still existing gender stereotypes
- existing ideas regarding the distribution of work in family and social surroundings
- traditional perception of women : they are responsible for raising children and should not pay any attention to their career,

and company internal ones:

- old boys' networks work quite well
- restricted access to male networks
- long working hours



Discussion

Some women engineers have their own explanation:

“Why are so few women top managers? Well do they really want to be? It involves so many sacrifices, at the personal and family level. Why do top management compel people to spend their lives working? I think that women are not ready to pay such a price!”

The price would be an unbalanced working and private life, avoiding which is a high priority for women. And the opinion of a German female engineer confirms this:

“It’s not desirable for women because the female concept of life and relationships is not compatible with management positions, so women cannot identify themselves with being a leader. Much effort would be necessary to create a female work environment.”



Conclusions (professionals)

The key moments in women's career are the same in the seven countries:

- **The first job is not a problem but having children and taking care of them is experienced differently according to the laws and regulations of the different countries.**
- **Another key point is the “culture” of the company and of the country. It is not accepted everywhere that a woman can work and can decently take care of her children even if examples of success and good practice exist.**
- **Stereotypes are stronger than reality!**
- **Another unsolved problem is the question of promotion, very often connected with the question of mobility.**
- **It is obvious that the glass ceiling exists for women engineers.**



Most Slovak interviewees would not recommend engineering as it is not an attractive job for women.

But as an Austrian woman stated:

“Being a woman engineer is not easy but it is great!”.