

Engineering Education: Academic Interests versus Industry Needs

CLAIU-EU/SEII Conference
Brussels, March 13, 2014

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Engineering Education

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Selection of past, ongoing and future trends in industry

- Customised solutions using standardised components
- Enhanced price competition
- Complete offerings including financing and service
- Increased speed of technical progress based on software, sensors, microelectronics and the internet
- System integration (e.g. cars)
- External factors gain importance
- Patents serve as weapons
- Products communicate with humans and each other
- 3-D printers revolutionise offerings
- Innovations arise at the fringes of diverse disciplines
- Knowledge-mining, crowdsourcing
- Reduced company cores, more flexible „satellites“ , time pressure
- Globalised, more diverse workforce
- Unpredictable environments ...

What industry is looking for: Problem solvers – not academic degrees

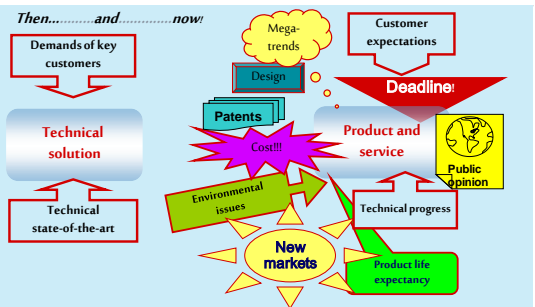
„I need a quick fix - not an analysis of the problem!“



Structure of my presentation

- Trends in the global markets and consequences for engineers
- What industry needs ...
- ... and what it gets: A selection of international surveys
- The gap explained
- The Siemens example
- Conclusion (The ideal profile)

A multitude of factors determine the work environment of today's engineers in industry



Fit for industry = a wide range of competences and skills

- Thorough knowledge of one's subject as the prerequisite for employment
- Ability to judge analytically, structure one's work, make "plausibility checks," carry out research, evaluate information and identify problems
- Ability to look beyond one's own area of competence and take other factors (such as costs) into account
- Independence, initiative, independent learning, work techniques, creativity, discipline, frustration tolerance, ability to set priorities
- Interpersonal skills: communication, feedback, a feeling for situations, capacity for teamwork, fluent English

Some skills can best be learned at the university, while others can also be acquired at work or in one's private life! Industry can (and should) help by providing occasions and know-how.

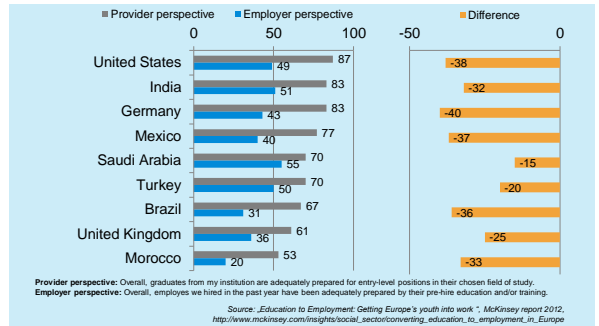
What business wants from Higher Education

Qualified graduates

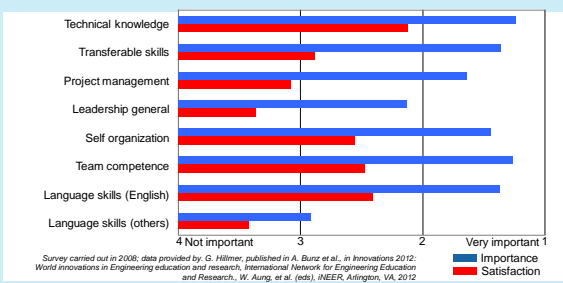
- In sufficient number (mobilisation of our human potential)
- With the wide range of levels and qualifications sought on the market (the content and not the academic title is what counts)
- With the competence required for working life (professional as well as other skills, e.g. key qualifications)
- Meeting the social requirements for diversity (e.g. more young women and migrants).

As the institutions which shape the actual education process, universities play a central part in determining the success of an engineering degree. But there seems to be a mismatch ...

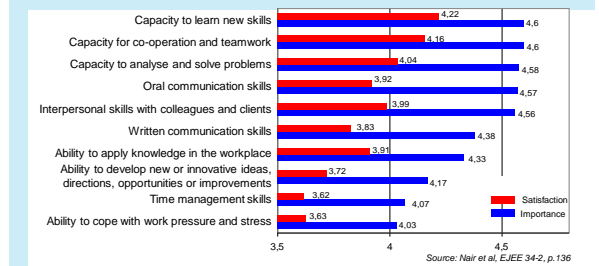
Agreement that graduates/new hires are adequately prepared
(% of respondents)



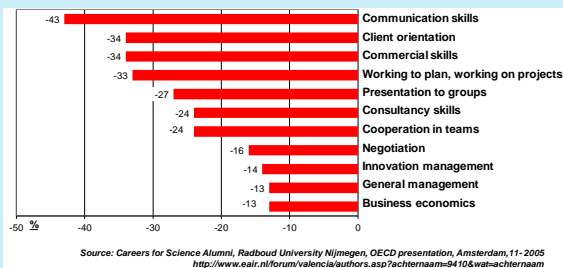
Germany: Skills of engineering graduates
- Importance and satisfaction of employers



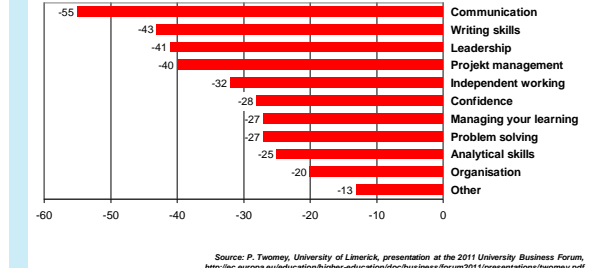
Australia: Skills mismatch
as seen by employers



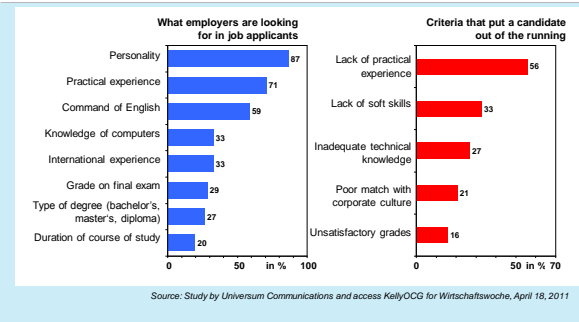
Netherlands: Deficits of S&T university graduates as seen by employers



Ireland: Deficits of university graduates as seen by employers



Germany: What skills and qualifications are employers looking for in general?



The gap as described by an expert:

"An engineer simply does not mean the same thing to a university and a company. The former defines engineers purely in terms of expertise and ability in their field, while the latter adds over twenty individual characteristics and abilities from "adaptable" and "team-oriented" to "reliable."
In other words: a brilliant technical expert who is not capable of working in a team or thinking in terms of the market and the customer does not fulfill the minimum requirements of the market, even when a company is "only" advertising for an engineer."

Heiko Mell, personnel consultant, VDI nachrichten, May 14, 2004

The gap explained: The mismatches observed can be attributed to the intrinsic differences between organizations and goals:

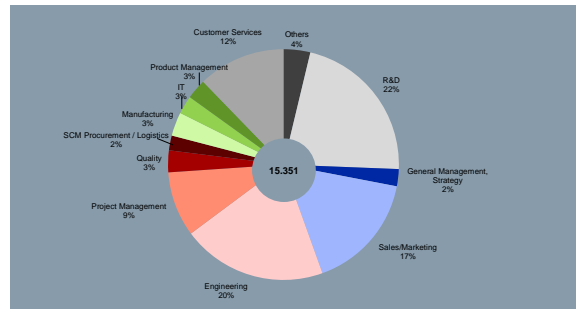
Universities:

- Salary structure and opportunities for promotion are often governed by the conditions of public service; (entry qualification is decisive; a caretaker can never become president); frequently lifelong specialization.
- Strong focus in first study phase on selection through "formula solving" i.e. reconstructing the solution to "closed" problems where the outcome is already defined; the emphasis is therefore on "regurgitating" knowledge for exams and the achievement of academic qualifications; later on research orientation to generate new knowledge.

Companies:

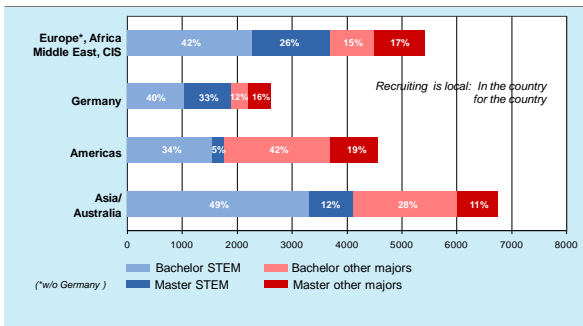
- Entry qualification important only for first job, later performance in a variety of deliberately different functions determines career success.
- The goal is the fast transformation of new ideas into innovations, i.e. the solution of basically "open," customer-specific problems (the best possible fulfillment of the market requirements) in order to earn money, for which flexible structures and teamwork are essential.

Where do electrical engineers work?
Siemens Germany, FY 2012



"Others" includes: Audit, Administration/Support, Communication, Finance, HR, Legal/Compliance, Real Estate, Environmental Protection, Health & Safety and those hirings, whose belonging to a specific job family has not been assessed at all.

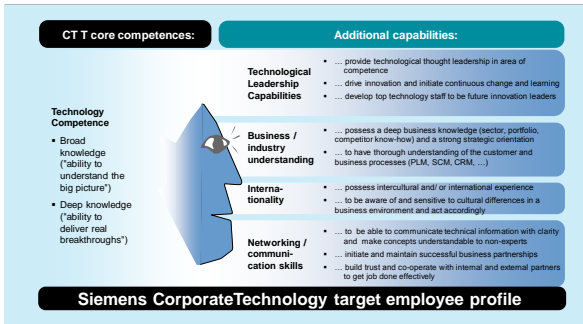
Siemens recruiting according to regions (FY 2012)
New employees with a university degree



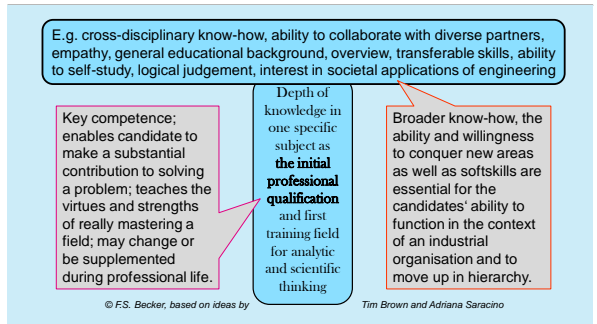
Siemens: Selection of general entry requirements for graduates

- University degree
 - Outstanding academic performance
 - Expert knowledge in your area of interest
 - Business understanding through practical experience
 - International experience and cross cultural sensitivity
 - Business English skills
 - Knowledge of language spoken at the specific workplace
 - Innovative thinking and curiosity
 - Eager to take over responsibility at early career stages
 - Energy and a sense of humor
- www.siemens.com/career

Siemens Corporate Technology needs entrepreneurship and professional networking capabilities



The ideal candidate possesses a T-shaped skills profile



**To sum it up - a comparison instead of a conclusion:
University education and practical application ...**

