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EUCEET GROUP H
Developing synergies between the academic and professional worlds

STATE OF THE ART – FINLAND
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This data set is based mainly on the "National Report on Workforce Education and Skills at the Construction and Real Estate Sectors 2008" (later referred as Report), compiled by the Association and Helsinki University of Technology, including some more recent statistical data.

1. MANPOWER SUPPLY FOR INDUSTRY

The total number of M.Sc. Civil Engineers in the workforce is estimated to be 5800 persons, while the whole population of Finland is approximately 5.2 Million inhabitants. The age structure of the employed is weighted to the age groups of 36 years and older, especially to those close to retirement (51-65). The recession of the early 1990s can be seen clearly as the small age group of 31-35 years. The intakes for the universities were cut roughly by 40 per cent in 1993-94, and a majority of graduates of the period 1992-1996 were employed to other sectors. Only few have returned.

The number of retiring civil engineers is estimated to be about 170 persons per year for the period 2008-2017. (Image 1)

Since 2001 the university intakes have been relatively stable, about 220-250 persons per year in two separate University units (Helsinki and Tampere). Civil engineering has also gained popularity year after year, as the number of primary applicants has grown to about 600 per year. However, the university dropout rates are still high, about 30 %. Thus the number of graduates can be estimated to be 150-170 persons per year at least till year 2015. Even though the young persons do not directly replace the experienced, the total number of graduates can be seen to be roughly on the right level. (Image 2)

Currently the number of graduates is first and foremost sensitive to keeping the university intakes stable and lowering the dropout rate. From the industry point of view, structurally a major factor is the division of work between M.Sc.:s and B.Sc.:s – the latter graduating from several Polytechnics.

The Report included a questionnaire on the employers' motivations to recruit in the close future or not. Major factor was the generic economic outlook. Remarkable factors were also staff retirement, company market share and demand for new skills. The results can be interpreted so that a grim generic outlook prevents recruiting, whatever the retirement rate.

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2. GRADUATE QUALITY, COMPETENCES, AND SKILLS SHORTAGES

The Report included also a questionnaire on the expected competences of young recruits. In addition to the 148 employers who answered, an interview round of 11 HR Directors and CEOs of leading companies was done.

Out of the two largest fields of skills for the young recruits, retrofitting was seen as 20 % more important than greenfield construction. This opinion preceded the fact that in 2009, for the first time in Finland the retrofitting industry volume grew larger than greenfield production.

When asked about the average skills of young recruits on a scale 0-5 (5 being excellent), the employers gave them the grade 3,7 (good plus, that is). This was the average for all recruits independent on the level of their education. University-level civil engineers scored 4,2. Open question on missing competences produced a longish wish list, but the small number of those answering does not provide statistical evidence.

The list on specific knowledge that graduates are typically missing included e.g.

- Energy efficiency and moisture control
- Eurocodes
- Automation
- Building Information Modeling BIM
- Bridge design, especially retrofitting
- Geomechanics and rock construction
- Railway design and construction
- Structural design.

Out of more general skills, both current employees and future recruits were considered to need further training on

- Project management
- Procurement, contracts and legislation
- Leadership skills
- Development skills
- Presentation skills
- Finance and economics
- Customer skills.

Both of these lists apply for all young recruits, but they are evidently true also for the subgroup of university graduates. They are also at least partially misleading, as in his or her early career a young employee typically needs only with a fraction of the listed skills and knowledge at a time. More will come with experience, supplementary training and more demanding projects. The employers' feeling that something is missing comes most likely from a difficulty in recruiting and/or difficulty in moving employees to new tasks of which they do not have previous experience of.

3. REQUIRED DEVELOPMENTS IN ENGINEERING EDUCATION

The Report concluded several points that are directly applicable to civil engineering education at universities. According to them, the studies should (more than now)

- be based on projects
- introduce typical project tools, starting from team work
- be closely knit to business by using visiting lecturers, especially in applied courses
- make sure that the visitors' input is applied also to the university's body of knowledge
- co-operate with other local educational institutions, both vocational and polytechnics
- consciously differentiate the university students' skills profiles from other institutions.

To ensure the future success of the construction and real estate sector, it was considered necessary to ensure enough resources for the university education in these fields. By now the resources even for basic teaching tasks were seen as worrisomely low. The universities were also expected to differentiate themselves from each other by directing teaching and research towards industry's and research and other educational institutions' local focus areas.

In addition to the two major viewpoints of today's civil engineering education – one for design and the other for construction – it was considered necessary to introduce a third approach. It should concentrate on customer needs and service businesses over the entire life cycle of the built environment.

The Bachelor degree caused some concern among employers. The degree was introduced to the Finnish higher education as a result of the Bologna process, having previously been at use only in the Polytechnics. The employers expected that close to no university student would skip the Masters part of their studies, as the first part is seen as theoretical and as one that does not provide real tools for working life. Same can be put more straightforward: Bachelors from Polytechnics are considered as readily productive, Bachelors from universities as raw material that cannot be used as such.

It was noted that not even a graduate with a Masters degree is productive from day one. This was not considered as a handicap, if the resulting graduate has the versatility, ability and will to learn and develop. Strong background on natural and applied sciences is necessary, but the true value of a university graduate is realized only when the technical knowledge is combined with administratively, financially and socially demanding projects and situations. To develop students towards this, the university should encourage students to interdisciplinary major-minor combinations. This should be done also by attracting students from other fields to choose their minor subject from construction and real estate.

4. FUTURE TRAINING NEEDS

All directors interviewed for the Report admitted that no clear set of skills and data will be enough for any graduate for his or her entire working life. The needs are changing at rapid pace at all levels of business, society and the environment. Thus it will be necessary to learn,

apply and also forget new and old truths throughout anybody's career. Training for this cannot be only the responsibility of the universities.

For updating the knowledge and skills of their personnel, all of the big companies had established programs for knowledge dissemination and training. At its simplest this meant short in-house info events once a week on acute matters. At the other end are the outsourced training packages comparable to 20-40 % of an MBA. Part of the outsourcing is bought from the universities, notably from their centers for extension studies.

5. IMPACT OF THE CURRENT RECESSION

Current downturn has cut construction site starts by 30-60 % (depending on the construction subsector) from previous year. The percentages are somewhat misleading, as 2008 saw the end of boom that has been accumulating since the last recession. The government has also been rapidly responsive to the demands of the industry and large recovery measures have been activated to avoid large-scale collapse. Out of the total work force of 190.000 employees, about 40.000-60.000 have been estimated to be unemployed still by the end of 2009. The structural base load is 15.000 unemployed even at the best of times.

For civil engineers, the outlook is still far from catastrophic. The total unemployment rate is about 2 per cent, which can be considered almost as full employment. The relative number of unemployed or laid off individuals has anyhow grown remarkably during 2009, being 230 persons by the end of July. As also construction sites are becoming completed by the end of year and large part of design work for close future is already done, the situation is still likely to get worse. It might take years for this development to change direction back to positive.

6. RESEARCH WORK IN COLLABORATION WITH THE INDUSTRY

At Helsinki University of Technology, 42 percent of the total funding comes from outside the University. Of this, roughly one half originates at the industry directly. Another half comes through the Finnish Funding Agency for Technology and Innovation, and the Academy of Finland**.** The funding is compiled from various research projects, which are supporting the final PhD- and MSc-theses. The topics for these projects originate often at the problems met in the industry. To some extent, the industry is supporting the basic research in addition.

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Appendix: Statistical graphs.