

Engineering Degree and Competencies

Janos BARSONY and Tibor KUKAI

University of Pecs, Pollack Mihaly Faculty of Engineering, Boszorkany 2. Pecs 7624H, e-mail:
barsony@pmmfk.pte.hu

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ABSTRACT: *Everybody (in Hungary) talks about the mutual recognition of diplomas in the EU, in particular connected with the implementation of the Bologna process as an achievement, but it is not generally known that it is necessary to have competencies for some activities.*

The contemporary engineer should be conversant with aesthetics, sociology, economics and ecology. In the socialist era engineering education was unambiguously specialist by nature in Hungary. With the political changes new demands presented themselves in engineering education: information technology, entrepreneurship, management, quality systems, service sector, politics, but unfortunately other demands presented themselves as well, which are not normally the tasks of higher education, e.g. language education.

There are activities, which if done inexpertly can be dangerous for society, people's safety, health and properties or the environment but the client can choose the contractor with confidence. For example: engineer - designer, expert, contractor, consultant, building supervisor – or medical doctor, lawyer. Their mistakes can have severe results so to avoid this society expects an official operation.

In former times the engineering diploma had the meaning of competency (license) simultaneously, but nowadays this is not permissible in every field. Today in most countries the professional engineering activity (e.g. PE – Professional Engineer) is defined by membership of the chamber – qualification - examination – registration. Of course it is necessary a lot of engineers should be in politics, in public administration, in the service sector and so on, as well, someone in whose education contains e.g. more social sciences, management etc.

In Hungary, according to the present right only an independent person who is a member of the chamber, and registered in the chamber's official "Register Book of Authorized Designers and Experts" can have a valid designer or expert competency, that is they have a Professional Engineer's License.

Professional requirement for the competencies.

The right defines the requirements about:

- Professional graduation*
- Professional experience*
- Professional training, e.g. the experience should be wide and of a high quality.*

The content of these categories are determined by the law and by the professional departments of the Hungarian Chamber of Engineers (HCE).

In the interests of applicant engineers and for information and guidance to engineering students the HCE announced professional requirements of the qualification system (contents of the diploma) in order to be judged by the same criteria. In the judgement of competencies the Hungarian Chamber of Engineers considers credits to determine the needed professional graduation, whose credits were harmonized and elaborated together for the engineering higher education. These credit tables are announced in the engineering higher education, therefore they help the students to choose the subjects for entry.

1 INTRODUCTION

Everybody (in Hungary) talks about the mutual recognition of diplomas in the EU, in particular connected with the implementation of the Bologna process as an achievement, but it is not generally known that it is necessary to have competencies for some activities.

In the last two decades many essential changes have come to pass in the demands of engineers (shift from manufacturing to services, environment, sustainability, globalization, collaboration with a variety of interest groups in a continuously changing social and technical context etc.). In society there has been a

significant structural shift from the manufacturing based economy towards the service based economy, which results also in the appearance of changing demands with connected engineering work. Today the opportunities for engineering creative work are less and less typical. The demand of the service-based economy is generalist engineer mostly, not specialist.

The contemporary engineer should be conversant with aesthetics, sociology, economics and ecology. In the socialist era engineering education was unambiguously specialist by nature in Hungary. With the political changes new demands presented themselves in engineering education: information technology, entrepreneurship, management, quality systems, service sector, politics, but unfortunately other demands presented themselves as well, which are not normally the tasks of higher education, e.g. language education.

Because of a reduction in staff, the considerable increase in numbers of students, a decrease in “contact” lectures of students (cc. from 40 to 22), in the implementation of the credit system the professor staff of engineering higher education comprehends these new subjects as an attack against the profession.

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In May 2001 at the time of the adoption of Directive 2001/19/EC on professional recognition, the European Parliament, the Council and the Commission agreed that “it is important to have consolidated versions, easily accessible to everyone, of the legal texts applicable in the field of mutual recognition of professional qualifications”.

In consequence of this increasing complexity the question also arises what tomorrow’s engineer has to know, what to teach engineers and what about the competencies?

The aim of my paper is to give an overall picture of the situation of the Hungarian issue in the field of competencies, as an opening for international comparison and discussion.

2 ABOUT THE COMPETENCIES

There are activities, which if done inexpertly can be dangerous for society, people’s safety, health and properties or the environment but the client can choose the contractor with confidence. For example: engineer - designer, expert, contractor, consultant, building supervisor – or medical doctor, lawyer. Their mistakes can have severe results so to avoid this society expects an official operation.

Another professional person's check can be a defense but this is a time-consuming and expensive method used only by a few rich countries and only in a few very important fields. The financial position of Hungary means only cheaper solutions can be expected at this time. It is a more practical and economical solution to choose well-prepared experts and only they will have the authority to do the service. The best way to judge the quality of an expert is to ask another expert with the same profession. Because of that the competencies with authority jurisdiction is given by the professional chambers (medical doctor, lawyer, engineer etc.) That is, the professional recognition of qualification in the field of regulated professions is required. Also in Hungary these activities - typically intellectual - need competencies to protect society. It is allowed to give competencies only to those who fit the requirement of the rights and it is best if the competency-giving is the right of the chamber. In Hungary we follow this way consistently in the cases of medical doctors and lawyers. We are inconsistent in the cases of engineers because the authorization:

- for designer and expert engineers, is the duty of the chamber
- for building supervisors, responsible builders, is the duty of a civil servant
- for special engineer activities (consultant engineer, investor etc.), is not solved.

The other important role of the chamber is to supervise the professional and good quality job, and warn careless engineers. It should be done in those engineering service fields which do not belong to the chamber's authority.

“The engineer should not transgress his/her own competency.

The engineer:

- a) can apply for a job or can work only in that field where s/he has a graduation, special professional practice and competency,
- b) cannot sign a plan or document for which s/he does not have competency and for a plan and document which was not checked and supervised by him/her,
- c) can accept a commission for co-ordinating a complete project with the whole responsibility and sign the complete documents of the project if each and every part of it was signed by the designer engineer who has competency for that job“

(Ethical-Disciplinary Code of Hungarian Chamber of Engineers)

3 HUNGARIAN CHAMBER OF ENGINEERS

In Hungary the Hungarian Chamber of Engineers conducts and certifies the qualification of professional engineers. The Hungarian Association of Engineers was formed in 1866. It did not function during the communist era. With the political change the Hungarian Chamber of Engineers (HCE) was again formed in 1989 and it became a public organization in 1996, when the Hungarian Parliament approved the “Act of Designing and Expert Engineers and Architects”. An engineering diploma and engineering practice (MSc degree + min. 2 years practice or BSc degree + min. 5 years practice) is needed for the membership of the HCE. The authorization to design or to be an expert has more conditions (see: The levels of the competencies). It is very important that the candidate’s work and qualification are evaluated by good experts in the same profession. To evaluate candidates professionally we have established professional departments in all the fields where the chamber has the right to give competencies. There are nineteen professional departments: Material conveyors, Construction-machine and Lifts; Medical Engineering; Electrical Engineering; Forest, Wood, Paper-industry and Agricultural Engineering; Building Engineering; Building Mechanics (Installation) ; Surveying, Mapping and GIS; Gas and Oil-industry Engineering; Geotechnics; Mechanical Engineering; Telecommunication and Information Technology; Heat and Electric energy Engineering; Environment Protection; Transport Engineering; Safety at Work; Hard-mineral Mining Engineering; Structural Engineering; Chemical Engineering; Water Management and Hydraulic Engineering.

4 THE COMPETENCY SYSTEM OF THE HUNGARIAN DESIGNERS AND EXPERTS

Rights background: There are 5 rights, 3 government orders, 6 ministers' 19 orders which refer to the competencies of the Hungarian engineer designers and experts. Because of the large number of orders the system is complicated. The Hungarian Chamber of Engineers has to handle more than 860 competencies. These competencies were not determined by the chamber but the law-makers.

The principle of the system

The competency system is based on the construction project. For example, the civil engineer gets competencies in six main professional areas. One of them is the water-structure designer main area which has five professional areas and twenty two sub-professional areas where competencies can be received. Expert competencies are available for other 17 sub-professional areas. These many different competencies referring to a narrow professional area which can be achieved with the same engineering degree. Because of the difficulties of the administration system the engineers are awarded competencies only for a narrow professional area not for the whole professional area they have studied. The name of the competency very often uncertainly shows the whole permitted area. The other fault is that activities appear very often which competencies have not been put into the competencies list by the law-makers; the competency list is huge but not complete. This fault is not the carelessness of the law-makers but the result of the system.

This competency system was developed in the Soviet Union. Also next to the engineer education with shortened curricula and study time, engineer-assistants were trained for a narrow professional area. The competency system is understandable knowing this system. We have used this system without criticism even if we give neither designer nor expert competencies to engineer-assistants. Our foreign partners do not know that and they think that

Hungarian engineers are trained only for a narrow professional area and they have competencies only for this narrow area.

What is necessary for the designer or expert competencies?

In Hungary, according to the present right only an independent person who is a member of the chamber, and registered in the chamber's official "Register Book of Authorized Designers and Experts" can have a valid designer or expert competency, that is they have a Professional Engineer's License.

The license is valid for five years. The permission given by an official organization has to be renewed in five years and entered into the chamber's register. Being on the name list can be suspended in that year when the owner does not practice the activity permitted for him. The Hungarian Chamber of Engineers publishes the official "Register Book of Authorized Designers and Experts" and it can be seen on the INTERNET every year.

The levels of the competencies

The designer competencies have two levels:

- Senior designer competencies or A-category for any duties
- Designer or B-category for simple less risky duties.

The expert competency has only one level. If the expert has a knowledge of the different areas having a connection with each other the chamber gives him/her senior expert competencies.

Professional requirement for the competencies.

The right defines the requirements about:

- Professional graduation
- Professional experience
- Professional training, e.g. the experience should be wide and of a high quality.

The content of these categories are determined by the law and by the professional departments of the Hungarian Chamber of Engineers (HCE).

Attitude of HCE to Qualification for Professional Graduation

In the interests of applicant engineers and for information and guidance to engineering students the HCE announced professional requirements of the qualification system (contents of the diploma) in order to be judged by the same criteria. In the judgement of competencies the Hungarian Chamber of Engineers considers credits to determine the needed professional graduation, whose credits were harmonized and elaborated together for the engineering higher education. These credit tables are announced in the engineering higher education, therefore they help the students to choose the subjects for entry.

For instance, in the case of the Structural Engineering Design License (elaborated by the Structural Engineering Department):

a) Conditions of contents of professional university (MSc) degree (total credits are 300)

- mechanics, structural theory subjects: min. 27 credits
- building structures, building physics, building services engineering, building materials, architecture subjects: min. 22 credits
- geotechnics, foundations subjects: min. 14 credits
- structural design (r. concrete, steel, timber, engineering works, bridges) subjects: min. 40 credits
- fulfillment of examination requirements
- defending of professional diploma work

If the diploma work is not professional, an additional 15 credits are needed from design subjects.

b) Conditions of contents of professional college (BSc) degree (total credits are 180)

- mechanics, structural theory subjects: min. 16 credits
- building structures, building physics, building services engineering, building materials, architecture subjects: min. 12 credits
- geotechnics, foundations subjects: min. 8 credits
- structural design (r. concrete, steel, timber, engineering works, bridges) subjects: min. 24 credits
- fulfillment of examination requirements
- defending of professional (design subject) diploma work

If the diploma work is not professional, an additional 10 credits are needed from design subjects.

Similarly the other departments elaborated contents of professional diploma as well. It is very important for the students to know the HCE requirements that they can choose subject (credits) in order to carry out their future plan. The necessary credits may be obtained in postgraduate courses as well.

Note: The Education Ministry has published a Diploma Supplement handbook in Hungarian containing information on the Diploma Supplement, the prototype of a Hungarian Diploma Supplement, up-to-date Hungarian-English terminology, and practical advice for the implementation of the Diploma Supplement in Hungary. The engineering education has implemented the credit system and the students can get the Diploma Supplement in Hungarian and in English.

Authorization

The requirements of the "Designer " or "B-category" competencies are nearly the same as the requirement of the chamber's membership. The regional chambers have the right to make decisions about the membership, giving lower level designer competencies and the renewal of the earlier given competencies without asking the professional department. To give competencies for senior designers or experts for the first time the regional chamber asks a professional opinion from the professional department.

Competencies of independent persons and companies

In Hungary (and in lots of other countries) only an independent person gets competencies for engineering services. An organization is allowed to give a service if it has a person with the right competencies who undertakes the responsibility proved by signature. A contract fixes how the person and the organization share the responsibility, but only the person has professional responsibility.

To keep the right

It is necessary to check the keeping of the right and using sanctions in cases of the breaking of these. Chambers of Engineers check the engineers' activities so that only those who have competencies can work keeping the right, producing a good quality job. If the engineer's activity is careless we judge it as an ethical case and we may exclude him/her from the chamber losing their competencies.

If an engineer does an activity without competencies we start an offence procedure against him at the authority. We asked the Ministry of Industry that illegal work would be judged under the Civil Rights.

5 DEVELOPMENT AND EU-HARMONIZATION OF THE COMPETENCY SYSTEM

In the EU the competency system of engineering services has "academic degree principle", it is totally different from the Hungarian "construction project principle" system.

When we join the EU, the competency system and operation of the chambers have to fit the EU requirements. Our competency system is quite unique and only changes are not enough. A complete overhaul is needed to make it a market economy type and EU compatible.

"The EU and Member States should attach priority to increasing the speed and ease of professional recognition (for regulated professions) including conditions supporting more automatic recognition, and introduce a more uniform, transparent and flexible regime for the recognition of qualifications in the regulated professions by 2005" (High Level Task Force on Skills and Mobility, Final Report, 14 December 2001, p. 20.)

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