

Globalisation and technological education in the Greek Engineering Model (GEM)

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ABSTRACT: In this article, the author defines the position of the higher education technological sector within the structure of the current dual professional institutional system in Greece. The author's analysis is based on objectives of the Scientific Society of Technological Education of Engineers and that current developments of the technological sector have been defined. New trends involving the professional and institutional rights of graduate engineers from technological education are presented in the article. Greater emphasis has been placed on new academic postgraduate qualifications that meet the objectives of the Institutional and International Scientific Society of Technological Education of Engineers, following an analysis of industry and the demands of graduates, members and practitioners for equality in the Greek Engineering Model (GEM).

INTRODUCTION

The Greek Higher Technological Education System

The higher educational system in Greece offers the opportunity for students to study engineering at the following types of schools:

- Universities (AEI) – public;
- Technical universities – theoretical oriented (eg NTUA): public;
- Technological Educational Institutions (ATEI) – (application oriented): public;
- Institute of Occupational Training (IEK) – technicians: private and public.

A very distinctive segmentation of professionals and students is currently taking place within the Greek higher and occupational education; this is based upon the *branch of sciences* [1].

Greece has engineering courses at technological institutions, technical universities and universities, and that segmentation determines the activity of high schools with an emphasis on the national examinations entry system.

After the membership of Greece was achieved within the European Union (EU), the development of industry and new technological applications have helped to regenerate the foundations of the technological institutions, its structure and syllabus, which still exist to this day. This has also created a certain vision of a graduate whose basic criteria, as far as the quality of education was concerned, included professionalism and opportunities for further academic development, which was understood as a thorough knowledge of a certain part of a technical field.

The Technological Educational Institutions (ATEI) belong to the higher education sector (under Law N. 1404/83 and N. 2916/2001) at the same academic level with universities and technical universities. ATEIs are legal entities under public law and are fully self-governed. Engineering degrees from ATEIs are at an academic equivalent with the four-year bachelor degree in engineering (BEng) from the UK and fachhochschulen (Diplom Ingeniure FH) of Germany.

TECHNOLOGICAL ENGINEERING SOCIETY

The Scientific Society of Technological Education Engineers (EETEM) constitutes the professional and scientific institution of graduate engineers who have come from Technological Educational Institutes (ATEIs) and other equivalent schools of Greece or from foreign countries (eg new universities, fachhochschulen), or other professional engineers who have graduated from recognised institutions of higher education at the same academic level. Its organisational structure is panhellenic/nationwide and consists of 47 peripheral departments at all the prefectures of Greece. EETEM members currently number 37,000 with an increasing trend to reach to 40,000.

The Scientific Society of Technological Education Engineers has registered as members those graduates from those schools of technological applications (engineering) that are listed in Table 1.

The objectives of the Scientific Society of Technological Education Engineers, among others, are as follows:

- The protection and progression of the common goals and interests of its professional members using all kinds of legal means;

- The advocacy and elevation of the scientific and technological standard of its members, especially as far as the areas of applied science and techniques are concerned;
- The contribution in the promotion of know-how and technology transfer, generally, and in cooperation with other organisations (bodies), for the self-dependent financial, social and cultural development of Greece.

Table 1: Schools of technological applications (engineering) from where graduate members of the EETEM come.

Electrical Engineering	Electronic Engineering	Structural Work Engineering
Mechanical Engineering	Petroleum Technology and Natural Gas	Surveying
Civil Engineering	Informatics Engineer	Energy Technology Engineering
Shipbuilding Engineering	Textile Engineering	Computer Systems
Vehicle Engineering	Automation	Medical Instruments
Mining Engineering	Geotechnology and Environmental Engineering	Industrial Design
Industrial Informatics	Informatics Technology and Telecommunications	Pollution Control
Applied Informatics and Multimedia	Informatics and Computer Technology	Technology of Natural Resources and Environment

The main activities of the Scientific Society of Technological Education Engineers are detailed below:

- Subscriptions and membership data – cards;
- Publication of the scientific and technical journal *Techniko Vima*;
- Provision of certifications that are requested from both the public and private sectors;
- The Professional Contact Committee provides certificates to members so that they can submit tenders;
- Definition of representatives to the Committees of Physical Planning, Housing and Environment – (Law no. 69ΦΕΚ60Α/9.3.2000);
- Membership of the Executive Board of the TSMEDE and participation in the Committee of the Constructor Experience Register (MEK) of the Ministry of Housing, Public Works and Environment;
- Membership of the National Board of Education (ΕΣΥΠ) and the Board of the Technological Sector of Higher Technological Education (ΣΤΕ);
- Participation on the Board of the Recognition of Professional Qualifications (European directive 89/48) and on the Committee of the Definition of Professional Rights for the recently established departments of the engineering specialisations at ATEIs (Law no. 165/2000 ΦΕΚ149Α/28-6-2000);
- Participation on governmental committees for the processing of legislative plans concerning construction projects.
- Cooperation with governmental and national organisations and Technological Education Institutes (ATEIs).

GLOBALISATION AND HIGHER TECHNOLOGICAL ENGINEERING EDUCATION IN GREECE

The role of the *university* or the *higher educational institution* in this age of transformation must be a leading one. In this increasingly global market, this role is closely bound to industry and its needs [3].

Badran stated the following:

Globalisation is a new challenge to engineering education and universities will increasingly compete in two areas. The first is the quality of education ... [and secondly] in research and development ... (quality research).

He went on to affirm the following:

Human development will be vital in order to harness science and technology for sustainable development. ... In terms of the global economic reviews, the industrial countries carry out over 80% of the world research [3].

However, Greece is listed at the bottom of the European Union in terms of funding research and development [4]. There is also a deviation of graduate engineers into two groups. The first concerns the theoretically-oriented engineers with unlimited professional rights, and secondly, covers the technologically-oriented engineers, who have limited professional rights that are derived from laws from the 1930s (Pre-World War II Presidential decrees).

By the year 2010, engineering education will have changed significantly from what it is now [5]. The changes in the structure, nature and operating environment of the Greek construction industry, as well as the industrial community's expectations for technological applications and developments, have had significant impacts upon the skills required of engineers in the period 1982-2006. This can also be compared with engineering education in Australia.

The rapid progress of technology, industrial changes, increased unemployment among young engineers and graduates, increasing complexity of engineering tasks (which has resulted in a considerable narrowing of engineering specialisations) and professional limitations for engineers of technological education in Greece, have all forced the ATEIs to develop postgraduate programmes in collaboration with universities. This is both within Greece (over 28 Master's degrees) and from abroad (eg the UK, USA, Italy, etc, with over 14 MSc programmes) [6][7]. Indeed, the growing demand for specialists, who have both engineering skills and management abilities, has changed the image of an engineer's role in the industrial process, real estate market and technical services. For example, the ATEI of Piraeus has developed postgraduate programmes for real estate, management in construction, etc [8].

The development of a comprehensive strategy for research and development (R&D) for a common syllabus applied by ATEIs, as well as the recognition of professional rights for graduates and professional engineers working in the Greek construction industry, are under the umbrella of the Scientific Society of Technological Education Engineers (EETEM) [9]. These are necessary in order to generate and transfer knowledge to the industry and to promote sustainable development.

Despite the long-term efforts undertaken by the academic community of ATEIs and the Scientific Society of Technological Education Engineers, the Greek Governments have not made enough progress against the EU's announcements/decisions for the European Sector of Higher Education (Bologna/Sorbonne 1998, Prague 2001 and Berlin 2005). Thus, Greek technological education engineers are not able to benefit from the internationalisation, as well as research, innovation and development, in comparison with other European graduates (eg Germans, British, etc).

It also needs to be taken into account the fact that the engineering industry is unique in being able to offer a wide variety of opportunities in the European Common Market [10]. In addition, many Greek and foreign technologically educated engineers, who have postgraduate or research degrees, could not contribute to, or participate in, research projects of ATEIs, in both the public and private sectors.

The new trends involving the professional and institutional rights of Greek engineering graduates with technological education are as follows:

- The unification of the professional engineering institutions of oriented and theoretical engineers is the only way to proceed in the future [11];
- The title of the Scientific Society of Technological Education Engineers (EETEM) is to be changed to the *Hellenic Chamber of Technological Education Engineers* with a Code of Conduct and full registration of all graduates [12];
- The Scientific Society of Technological Education Engineers (EETEM) is to be recognised as an equal professional and scientific institution with the Institution of Theoretical Oriented Engineers (TEE) [13];
- The creation of the Greek Engineering Council of Technological Education;
- The minimisation of the Scientific Society of Technological Education Engineers (EETEM) and its professional recognition, and being under the umbrella of the theoretically-oriented Technical Chamber of Greece, as well as supervision by the Ministry of Public Works, Planning and Environment [14].

The requirements of international collaboration in engineering and technology education are as follows:

- The transformation of information on engineering and technological applications;
- The recognition of foreign qualifications and accreditation systems for engineering and technology courses;
- The international mobility of academic staff, researchers, graduates and students;
- International collaborative programmes and systems [15].

Engineering education is not static; but rather a dynamic system that responds to a variety of social, educational, financial, environmental and technological factors [16].

The Greek Engineering Model (GEM) of technological education should not be static, but rather should comply with the requirements of international collaboration in engineering and technology education, and with the European Union's Directives and Decisions for the European Sector of Higher

Education. It should also simultaneously promote academia-industry linkages.

Globalisation has knocked on the doors of the Greek educational system, and under the umbrella of the Scientific Society of Technological Education Engineers, graduates can promote their academic objectives and benefit from academia-industry partnerships.

Further professional recognition delays and conflicts create a negative environment and establish *discrimination* against technologically-educated engineers, which is generated by the current Greek Engineering Model (GEM).

CONCLUDING REMARKS

The ability of the Greek Engineering Model (GEM) to satisfy the current and future needs of European industries, the European Union, the international mobility, as well as a life-long commitment to learning/training, defines the quality of technological engineering education within the educational system in Greece.

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