Employment trends for engineers in Greece: a multidisciplinary survey

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ABSTRACT: The article presents the results of a survey concerning recent trends in employment opportunities for engineers in Greece. The survey was based on private sector classifieds published weekly in the official bulletin of the Technical Chamber of Greece (TCG). The survey covered all major engineering degrees awarded by Greek Universities (AEI) and Greek Technological Educational Institutes (TEI). The classifieds were indexed and the results presented here are in a number of statistically processed formats, in order to reveal the various trends regarding company/position type and discipline, degree, qualifications and experience requirements. Correspondence analysis was used to show any overlap between the various engineering disciplines and between AEI and TEI awarded degrees. It is expected that the results of the current survey will be used by Higher Educational Institutes to adapt their curricula to the needs of emerging labour markets, as well as to offer appropriate continuing education courses.

INTRODUCTION

The scenery of tertiary education in Greece has changed dramatically recently. The main drivers of this change include new legislation to upgrade Technological Educational Institutes (TEI), European Community (EC) directives, the Bologna Declaration and a policy for developing and applying evaluation mechanisms and providing continuing education [1-3].

Another phenomenon is that over the last few years, many departments have changed their title and many institutions have founded new departments with multidisciplinary or alternative engineering titles. The question arises here whether the labour market is ready to utilise these degrees or is it staying adhered to traditional engineering ones?

Although higher education institutes are state-funded, criticism still exists [4]. In general, there is a movement towards restructuring in a highly competitive manner. In this new era, higher educational institutions should consider evaluation and providing students with qualifications that can be applied in the labour market [5][6].

The purpose of the current survey is to outline the profile of the Greek employment market for engineers so that educational institutions can adapt their curricula to emerging labour market needs and to offer appropriate continuing education courses.

RESEARCH METHODOLOGY

The Technical Chamber of Greece (TCG) publishes a weekly bulletin that includes employment classifieds for engineering disciplines. Over the years, this Bulletin has become a standard for employment vacancies for engineers. Within the scope of the current survey, these classifieds were indexed and decoded so as to produce meaningful employment market trends.

The survey covered the period from June to August 2002, which corresponds to TCG bulletin issues 2202 to 2212. Each classified could contain one or more positions and could appear in more than one issue. Duplicate classifieds were filtered out using the telephone or fax number of the employer. The sample consisted of 334 unique positions. Each unique position offered was indexed as in shown Table 1.

Table 1: Indexing schema.

Company type	Position type
Main discipline	Degree of main discipline
Alternative discipline	Degree of alt. discipline
Knowledge of AutoCAD	Basic computer skills
Knowledge of special design software	Knowledge of the English language
Experience	Area

To ensure equal treatment of all disciplines, even if they appeared as alternative ones, those positions with two disciplines were entered twice with switched main and alternative disciplines. A weight of 1 was then given to all these positions, while a weight of 2 was given to positions with only one discipline.

The data of the survey were statistically analysed in terms of frequencies and Chi-square correspondence analysis [7]. The statistical results were obtained for both the whole sample and each individual discipline.

GENERAL STATISTICS

Table 2 presents the general statistics, revealing the following:

- Most positions were for inexperienced engineers or those with a low level of experience.

- Over ⅓ of offered positions were for civil engineers, while those for surveyors and chemical engineers were significantly lower than the first three disciplines.
- Most company types were construction and design companies, while the majority of position types were supervision and design. Construction companies were related to supervision and design companies to design positions, as expected and as further correspondence analysis indicated.
- Most positions were for graduates from Greek Universities (AEI), although there is an emerging need for TEI graduates.
- Knowledge of CAD software and, more specifically, AutoCAD is a requirement of nearly ⅓ of all positions. There were similar requirements for basic skills in computers and the English language.

Table 2: General statistics for Greek engineering positions.

Discipline	%
Civil Eng.	32.3
Mechanical Eng.	18.9
Architect	18.4
Electrical Eng.	10.0
Surveyor Eng.	5.4
Chemical Eng.	2.4
Other/Unspecified	12.6

Position Type	%
Design	34.1
Supervision	27.5
Quality/Safety Eng.	6.6
Sales	6.0
Managerial	4.2
Manufacturing	2.4
Other/Unspecified	3.0

Company Type	%
Construction	35.3
Design	26.3
General Techn. Co.	15.9
Industry	6.9
Trading Co.	5.7
Other/Unspecified	9.9

Experience	%
No	39.8
1 year	34.1
3 years	12.3
5 or more years	13.8

Degree	%
AEI only	69.2
AEI or TEI	20.1
TEI only	10.8

Knowledge	%
AutoCAD	29.3
Computer Skills	37.4
Special design s/w	9.6
English Language	26.9

Furthermore, the majority of positions concerned Athens (88%) and a small percentage concerned Thessaloniki (3%), the rest of Greece (7.2%) and abroad (1.8%).

With regard to experience requirements, the analysis of correspondence (see Figure 1) revealed the following:

- Manufacturing, technical support and quality/safety engineering positions were related to inexperienced staff.
- Sales positions required some experience.
- Supervision and design positions required approximately three years of experience.
- Managerial positions were for very experienced personnel, as could be expected.

KNOWLEDGE REQUIREMENTS

A more analytical representation of required knowledge and skills is presented in Table 3. As expected, AutoCAD is required in the majority of design positions and basic computer skills requirements are present in all types of positions.
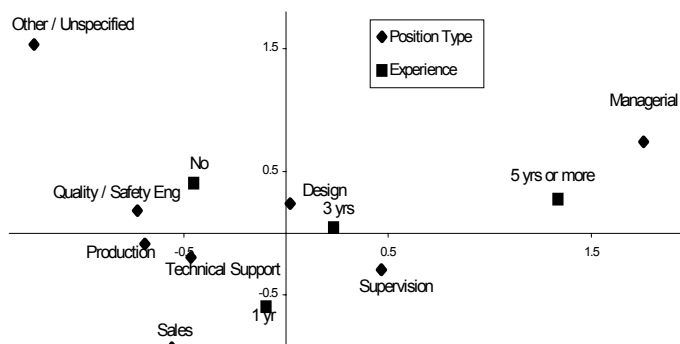

Figure 1: Position type/experience correspondence.

Table 3: Required skills for various positions (% of Positions).

Position Type	AutoCAD	Computer Skills	Special Software	English Language
Design	66.7	28.9	23.7	21.9
Supervision	13.0	30.4	2.2	9.8
Sales	-	55.0	5.0	55.0
Technical Support	14.8	53.7	-	38.9
Manufacturing	-	62.5	-	62.5
Managerial	7.1	57.1	14.3	64.3
Quality/Safety Eng.	-	36.4	-	45.5
Other/Unspecified	10.0	30.0	-	-

Furthermore, in order to provide a more generalised approach, a schema was designed to summarise the knowledge and skills requirements in one ordinal variable. Accordingly, points were assigned to each knowledge requirement, as follows:

- Knowledge of special design software: 20 pts;
- Knowledge of AutoCAD: 15 pts;
- Basic computer skills: 10 pts;
- English language: 10 pts.

The ordinal variable, named *qualification categories* for each employment position, provided the sum of points for each position. Categories and their frequencies are given in Table 4.

Table 4: Qualification categories.

Category	Points	Positions %
Unqualified	0	37.4
Low	10-20	45.8
Medium	25-40	12.6
Highly Qualified	45-55	4.2

Correspondence analysis for qualification categories and position types is shown in Figure 2.

TARGET GROUPS

Another interesting analysis concerning the various positions is how specific the requirements regarding the discipline and degree (AEI/TEI) were. An ordinal variable named *target group categories* was introduced, as shown in Table 5. Further correspondence analysis revealed that design and sales

positions had very specific requirements. Managerial, and especially supervision, positions are related to the narrow category, while manufacturing and technical support positions are related to medium. Finally, quality/safety positions were aimed at a wide target group.
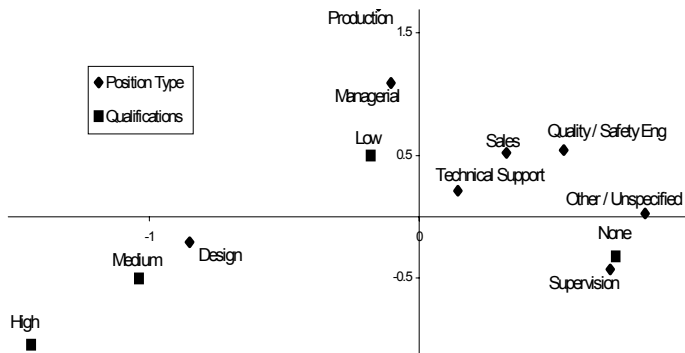

Figure 2: Position type/qualifications correspondence.

Table 5: Target group categories and frequencies.

Categories	Description	%
Wide	Unspecified engineer or two disciplines AEI or TEI	16.5
Medium	Two disciplines but specific AEI or TEI	18.3
Narrow	One discipline but AEI or TEI	11.7
Very Specific	One discipline and specific AEI or TEI	53.6

DISCIPLINE SPECIFIC STATISTICS

Table 6 presents an analytical summary of the statistical results for each discipline. Some significant findings include:

- Construction companies are the major employer for civil (52%) and electrical engineers (42.9%).
- Surveyors and architects are mainly required for design related positions (52 and 72.5% respectively).
- Mechanical engineers have opportunities in a very wide range of position types: from manufacturing (7.1%) to technical support (24.7%)
- Chemical engineers are mainly required for sales (36.4%) and for providing services to general technical (36.4%) or other (36.3%) companies.

The following details were also found:

- Surveyors, civil engineers and especially architects are strongly required to have the knowledge of AutoCAD.
- Mechanical, electrical and chemical engineers are required to speak English and have basic computer skills.
- The majority of offered positions for all disciplines require staff with little or no experience.

Regarding degree overlap, Figure 3 presents an emerging demand for TEI graduates, especially electrical and mechanical engineers (49% and 41.2% of positions respectively).

Correspondence analysis for mechanical engineers (see Figure 4), for example, exhibits the opportunities for TEI graduates in various position types. Similar analysis for civil engineers revealed opportunities for TEI graduates in sales, quality/safety engineering and technical support positions.
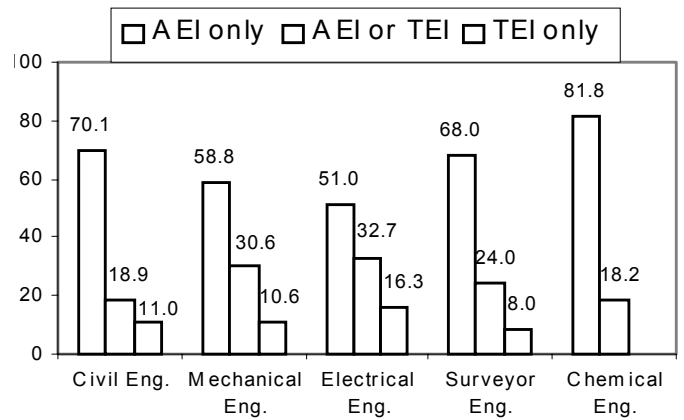

Figure 3: Overlap of degrees.

Table 6: Discipline specific statistics (% of positions).

|	Civil Eng.	Mechanical Eng.	Architects	Electrical Eng.	Surveyor Eng.	Chemical Eng.
Position Type						
Supervision	43.3	22.4	11.7	36.7	32.0	-
Design	31.5	15.3	72.5	12.2	52.0	9.1
Technical support	15.0	24.7	10.1	16.3	8.0	27.3
Managerial	3.9	5.9	-	-	4.0	-
Quality/safety eng	3.9	7.1	1.4	4.1	-	27.2
Sales	1.6	11.8	1.4	8.2	4.0	36.4
Manufacturing	-	7.1	-	10.2	-	-
Other/unspecified	0.8	5.7	2.9	12.3	-	-
Company Type						
Construction	52.0	30.6	23.2	42.9	32.0	-
Design	27.6	8.2	55.1	10.2	52.0	-
General tech. co.	13.4	18.8	15.9	16.3	8.0	36.4
Trading co.	1.5	12.9	-	8.2	4.0	18.2
Industry	1.6	15.4	-	12.2	-	9.1
Other/unspecified	3.9	14.1	5.8	10.2	4.0	36.3
Knowledge						
AutoCAD	25.2	16.5	63.8	14.3	36.0	9.1
Computer skills	33.9	44.7	21.7	44.9	32.0	45.5
Special design s/w	10.2	5.9	14.5	10.2	20.0	-
English language	15.0	43.5	8.7	38.8	20.0	45.5
Experience						
None	38.6	38.8	47.8	44.9	52.0	36.4
1 year	29.1	42.4	23.2	49.0	32.0	36.4
3 years	14.2	10.6	14.5	2.0	12.0	27.3
5 years or more	18.1	8.2	14.5	4.1	4.0	-
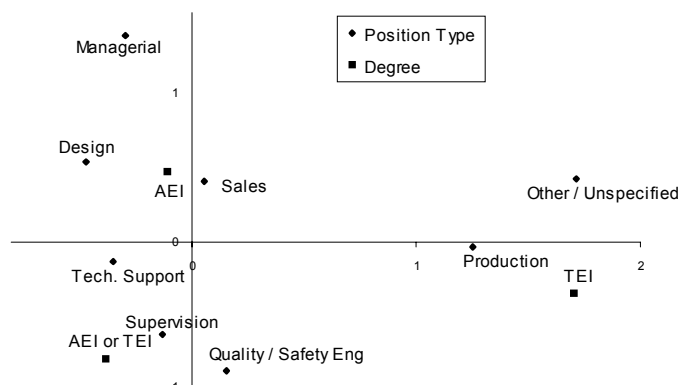
Figure 4: Position type/degree for mechanical engineers.

Finally, another aspect of the survey was that many positions were concerned with more than one discipline. This discipline overlap, presented in Table 7, revealed that civil engineers and architects have reduced competition from other disciplines. Also, mechanical engineers compete directly with electrical engineers, as well as civil and chemical engineers. However, surveyor, electrical and chemical engineers were found to be in the most unfavourable position.

Table 7: Discipline overlap for various disciplines.

Civil Eng.	%		Mechanical Eng.	%
Civil Eng. only	70.1		Mechanical Eng. only	48.2
or Architect	11.8		or Electrical Eng.	36.5
or Surveyor Eng.	11.0		or Civil Eng.	9.4
or Mechanical Eng.	6.3		or Chemical Eng.	5.9
or Chemical Eng.	0.8			
			Electrical Eng.	%
Architect	%		Electrical Eng. only	36.7
Architect only	78.3		or Mechanical Eng.	63.3
or Civil Eng.	21.7			
			Chemical Eng.	%
Surveyor Eng.	%		Chemical Eng. only	45.5
Surveyor Eng. only	44.0		or Mechanical Eng.	45.5
or Civil Eng.	56.0		or Civil Eng.	9.1

CONCLUSIONS

The survey revealed a number of interesting issues concerning the private sector employment market for engineers in Greece:

- Civil engineers have a very strong position with a large employment market share and minor competition from other disciplines and TEI graduates. They should focus on supervision and design positions and seek experience quickly.
- Architects also have adequate position offerings, very little competition from other disciplines and no TEI graduates to compete with, primarily due to a lack of relevant TEI degrees. They should also try to gain experience quickly, together with AutoCAD knowledge.
- Mechanical engineers are offered a wide range of position types and, although they have a noticeable market share, they have to compete with other disciplines (particularly electrical engineers) and TEI graduates.
- Electrical engineers have strong competition from mechanical engineers and TEI graduates. A focus on supervision, technical support and manufacturing positions is recommended, together with the acquisition of a variety of skills and knowledge in order to be competitive.
- Surveyors have low market share; they should focus on design positions and thus should learn AutoCAD to be competitive.
- Chemical engineers could seek a job in technical support, quality/safety engineering or sales. Skills in computers and the English language would be to their strong advantage.

It seems that TEI graduates could compete widely with AEI graduates, mainly in manufacturing, quality/safety, technical support and supervisory positions. They could gain an advantage over AEI graduates if they were better qualified in AutoCAD, computer skills and the English language.

Concerning position types, the emerging need for quality/safety engineers can be explained by two facts:

- Recent Greek legislation has required each company to have an engineer in charge of safety issues.
- The latest trends to acquire quality certificates (eg ISO 9000).

Another finding was the very low percentage of positions offered in the manufacturing sector. This is most relevant since there are currently three AEI engineering departments with manufacturing-related curricula and titles. The total new entries for 2002 in these departments was 445 students, compared to 530 in traditional mechanical engineering AEI departments. It should be noted that the new entries are regulated by law [8].

Finally, the reasons why the majority of positions concern Athens include the following possible explanations:

- Athens is the capital with the 40% of the total Greek population.
- Many companies, while based in Athens, seek personnel for projects outside Athens.
- There are many construction projects in Athens concerning the 2004 Olympic Games.

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