THE ICT PROFESSIONS IN GREECE: INVESTIGATING THE EFFECTS OF ENTERPRISE PROFILE CHARACTERISTICS

Vassilis Kostoglou
Associate professor
Alexander Technological Educational Institute of Thessaloniki

Abstract

The deep accession of the Information and Communications Technologies (ICT) in the economic activities and the labour market give particular interest on the study of this sector's professions. This work turns its interest on the analysis of these professions concentrating on the investigation of the labour market effects on them. A national survey on all ICT enterprises residing in Greece was conducted for this purpose, using as research tool a structured questionnaire. Totally 343 questionnaires were collected, corresponding to a satisfactory response rate of 30.2%. The parameters examined are the professions' spreading in the market as well as the capabilities for employment of the corresponding specialists. The statistical analysis focuses on the examination of the effects of the main enterprise profile characteristics. The professions are categorized according to criteria such as their presence in the market, the relevant employment capabilities and the number of significantly affecting variables. Six professions are suggested to the youngsters as offering better prospects and lower unemployment risks. Some indications, based on the affecting characteristics, are reported for all professions, aiming to a more efficient career orientation.

Βασίλης Κώστογλου
Αναπληρωτής καθηγητής
Αλεξάνδρειο Τεχνολογικό Εκπαιδευτικό Ίδρυμα Θεσσαλονίκης

Περίληψη

Η έντονη εισδοχή των Τεχνολογιών Πληροφορίας και Επικοινωνιών (ΤΠΕ) στις οικονομικές δραστηριότητες και στην αγορά εργασίας προσδίδουν ιδιαίτερο ενδιαφέρον στη μελέτη των επαγγελμάτων αυτού του κλάδου. Η παρούσα εργασία στρέφει το ενδιαφέρον της στην ανάλυση των επιδράσεων των χαρακτηριστικών της αγοράς εργασίας στα επαγγέλματα ΤΠΕ. Για το σκοπό αυτό πραγματοποιήθηκε εθνική έρευνα πεδίου στις επιχειρήσεις ΤΠΕ που εδρεύουν στην Ελλάδα χρησιμοποιώντας ως ερευνητικό εργαλείο ένα ερωτηματολόγιο.

Συνολικά συλλέχθηκαν 343 έγκυρα ερωτηματολόγια (ποσοστό απόκρισης 30,2%). Εξετάζονται η διασπορά των επαγγελμάτων στην αγορά εργασίας καθώς και ο βαθμός ευκολίας / δυσκολίας εξεύρεσης αντίστοιχων ειδικών. Η στατιστική ανάλυση επικεντρώνεται στις υφιστάμενες επιδράσεις των χαρακτηριστικών του προφίλ των επιχειρήσεων στα επαγγέλματα του κλάδου. Αυτά κατηγοριοποιούνται ανάλογα με τη διασπορά τους, τις δυνατότητες απασχόλησης και τον αριθμό των επιδρώντων ανεξάρτητων μεταβλητών. Έξι επαγγέλματα προτείνονται στους νέους επαγγελματίες ως προσφέροντα καλύτερες προοπτικές και χαμηλότερο κίνδυνο ανεργίας. Τέλος, καταγράφονται ορισμένες διαπιστώσεις για όλα τα επαγγέλματα του κλάδου, στοχεύοντας σε μια πιο αποτελεσματική επαγγελματική σταδιοδρομία.

Key words: Information and communications technologies, labour market, job selection, employment capabilities.

JEL classification: J_{23}, J_{44}

THE ICT PROFESSIONS IN GREECE: INVESTIGATING THE EFFECTS OF ENTERPRISE PROFILE CHARACTERISTICS

Vassilis Kostoglou
Department of Informatics,
Technological Educational Institute of Thessaloniki,
P.O. Box 141, 574 00, Thessaloniki, Greece.
Tel/fax: +30.2310.791294   E-mail: vkostogl@it.teithe.gr

1. Introduction

The professions of the Information and Communications Technologies (ICT) have been the focal point of several bodies and scientists. The reason is obvious: the professions' analysis mirrors the current status and the trends of the corresponding labour market. Especially in the rapidly changing ICT sector, which caused catalytic effects on economic and social activities, their observed lack of homogeneity among states or even regions of the same country reveal the large existing differences in the development of the sector (Siskos et al., 2003). Moreover, practicing a job with positive prospects is nowadays one of the principal priorities of the young. Therefore, the analysis of the ICT professions presents particular interest for young people desiring a favorable professional future as well as for researchers aiming to draw conclusions with practical contribution.

The literature review proved that some hundreds of distinct ICT jobs have been determined and profiled up to this day. One of the early relevant attempts has been carried out by the European Commission with the formation of a table named NACE (Nomenclature Générale des Activités Economiques dans les Communautés Européennes) including all professional economic activities. This table was consecutively adapted to every member-state according to its specific local environment (Communautés Européennes, 1990). The corresponding table for Greece reported 7 classes and 12 categories including 31 professional activities directly related to information technology (IT).

Just as with other main ICT labour market parameters (occupation areas and specialization sectors), American bodies and researchers examined this sector's professions more extensively (Kostoglou and Paparrizos, 2003). In a study on definition of forthcoming skills for IT, the Northwest Center for Emerging Technologies (NWCET) appoints 128 distinct specialties / professions, which have been used up to date in USA (Northwest center for emerging technologies, 1999). In order to determine and classify the IT professions, the US Ministry of Labor is based methodologically on the dictionary of occupational titles (O*NET). According to it 17 major distinct ICT professions are determined (US Ministry of Labor, 1998). The IT training company New Horizons published the detailed profiles of 15 major IT professions (New Horizons, 2002). Farr and Ludden (1999) in their book about the best foreseen jobs of the 21st century examine the profile and the prospects of 11 ICT professions. A high annual growth rate of the anticipated corresponding work places is expected for nearly all of them.

On the contrary, only a few Greek studies have determined or used IT professions. The last published national statistical classification of professions includes 7 classes and 12 categories containing 31 professional activities related to IT without defining their work content (National Statistical Service of Greece, 1995). The most important relevant attempt was carried out by the

Greek Computer Society aiming to specify the corresponding needs of the public sector. Based on the European model of CEPIS (Council of European Professional Informatics Societies) 7 distinct occupation areas and 46, existing in Greece, professions are proposed (Greek Computer Society, 1996). Most other relative studies focus on forecasting the prospects of various jobs in the labour market and derive the ICT professions from the corresponding departments of higher education or from degrees awarded by the typical educational system. Katsanevas on consecutive attempts to calculate the balance of supply and demand of most jobs in Greece determines initially (1998) 34 and more recently (2002) 38 IT professions, correlating them with the corresponding required education level. Finally, in an investigation study concerning the labour market needs of Universities' and Technological Education Institutes' specialties 16 IT professions are considered, related directly to awarded degrees (Klimopoulos et al., 1999).

One of the main conclusions derived from the literature review is that, despite the large reference and use of the ICT professions, there is luck of research concerning the examination of the factors affecting the use or other characteristics of these professions. Some relevant efforts focus on the ICT labour market effects on human resource management (Kostoglou et al., 2004a) or on the employability of ICT postgraduates (Kostoglou et al., 2004b).

This paper turns its interest on the examination of labour market's effects on the ICT professions. More specifically it focuses on the investigation and analysis of the effects of the enterprise profile characteristics on professions' principal parameters; on their spreading in the market and on the capabilities for employment of the corresponding specialists. Regarding the structure of the paper initially the research objectives and its contribution are discussed. Next section deals with the description of the two-phase methodology adopted, emphasizing on the conduct of a national survey on the ICT enterprises residing in Greece. The main results are presented in the fourth section including the enterprise profile characteristics, the professions' spreading and the relevant capabilities for employment. Paper's main fifth section concentrates on the statistical analysis of enterprises' effects on the professions' principal parameters. Categorizations of professions are also attempted according to the number of significantly affecting independent variables. Finally, some concluding remarks and research's practical implications are discussed in paper's last section.

2. Objectives and contribution

This paper is concerned with the analysis of one of the important variables of the ICT labour market; the most popular professions exercised by the sector's specialists in Greece. Work's main objective is the detection of the existing effects on professions' spreading and employment capabilities by some labour market parameters namely, the characteristics outlining

the sector's enterprises profile. This is achieved with extensive analysis of first-born data collected through the conduct of a national survey on the ICT enterprises.

Presented results and conclusions drawn are novel as this research is, to the extent of our knowledge, the first of its kind accomplished in Greece and elsewhere. The originality of the work is the analysis of labour market's impacts on the ICT professions and its attempt to categorize them according to the number of significantly affecting enterprise characteristics.

Regarding this paper's practical implications, its conclusions are firstly addressed to the professionals who are interested in making a successful career in the ICT sector; prospective ones who look for appropriate studies and specialization for a fruitful professional future and more experienced who, having entered the market, seek for a career with promising prospects and low risks. The paper's results are also addressed to the scientists and executives who are interested in the present status quo of the ICT professions in the labour market.

3. Methodology

The analysis of the ICT professions and the detection of the enterprise characteristics' effects on them are based on a two-phase research model. The first phase was carried out at an earlier stage and aimed to the identification of the most significant ICT professions existing in Greece. These professions were selected by a group of 20 experienced IT specialists of the academic community and the labour market. A long list of professions collected from the relevant literature was handed to all group members. They were interviewed individually in order to select the presently existing professions. The relative selection frequency by the group members was chosen as the main criterion for inclusion of a profession in the final list. A lower acceptance limit of 35% of the corresponding frequency was also set. This first phase yielded a 30-item list of professions (Kostoglou and Paparrizos, 2003)..

The second research phase, presented in this paper, is based on first-born data yielded by a national survey addressed to all ICT enterprises residing in Greece. It was decided to focus on these companies because they constitute a well-defined large population, consisting at the time of the survey of 1134 active enterprises, and representing adequately the sector's total market. A structured questionnaire, specially designed for this purpose, was chosen as the most feasible and reliable tool for data collection. Questionnaire's design and layout were according to internationally accepted standards taking into account that some questions aim measuring respondents' attitudes (Oppenheim, 1966 and Fowler, 1993)

Four 'closed' questions are used for outlining the enterprises' profiles. The characteristics examined are the location (in three categories; Athens, Thessaloniki and the rest of the country), the age (in four, five-year interval, categories according to the first year of company's

operation), the size (in six categories based on employees' number) and the geographical range of activities (local, regional, national and international activation). The next 30 questions concern the selected ICT professions. They aim to investigate the spread and the capabilities for employment of each one of the 30 professions yielded by the first research phase.

A pilot survey was carried out before the final distribution of the questionnaire. It was given out to 20 specialists (12 academics and 8 senior members of the labour market) for the evaluation of its validity and clarity. This pilot survey leaded to the final contents and layout of the questionnaire and its cover letter.

Survey's conduct was planned with the use of network analysis and lasted five months (Kostoglou, 2002). Emphasis was given to responses' credibility and response rate maximization (Linsky, 1975). In order to achieve the latter goal the researcher collaborated with the two largest relevant bodies of Greece. The Federation of Hellenic Information Technology and Communications Enterprises (SEPE) and the Association of Information Technology Companies of Northern Greece (SEPVE) supported the survey according to decisions of their boards of directors.

The questionnaires were sent through post and electronic mail to all ICT enterprises. In order to raise the response rate, some effective techniques were applied, such as prenotifying the potential respondents through the World Wide Web for the upcoming research (Schegelmilch και Diamantopoulos, 1991), supplying a response envelope (Armstrong and Luck, 1987) and sending two reminders to those who did not respond initially (Pacel et al, 1971). Respondents had four alternative ways to return the completed questionnaires: by post, by fax, via internet and through personal contact with the researchers. This variety contributed substantially for collecting a large number of responses. The number of collected valid questionnaires came up to 343 which correspond to 30.2% of enterprises' total population. The aggregate response rate is considered according to international standards as satisfactory and adequate for deducing credible conclusions (Fowler, 1993 and Linsky, 1975).

4. Main results

The statistical analysis of the collected information was carried out with SPSS, (v. 12.0), the statistical package for the social sciences. Analysis' objects are the 30 professions yielded from the first research phase and the corresponding responses of the enterprises' representatives in the survey conducted on the second phase. Dependent variables are the professions' spreading in the market and the degree of easiness or difficulty faced by the enterprises for finding specialized personnel for employment. As problem's independent variables are considered the four principal characteristics outlining the ICT enterprises' profile.

4.1. The enterprise profile characteristics

The analysis of the main enterprise profile characteristics is presented in table 1. There are some interesting findings such as the high centralization of the ICT companies in Athens and secondarily in Thessaloniki and the foundation during the decade of '90s of over the half of the presently existing companies.

Table 1. ICT enterprises' profile characteristics

Location	(%)*
Prefecture of Athens	55.1
Thessaloniki	27.1
Rest of Greece	17.8
Age (year of foundation)	(%)
After 1999	12.3
Between 1995 and 1999	29.5
Between 1990 and 1994	21.6
Before 1990	36.6
Size (number of employees)	(%)
1 – 10	40.2
11 – 20	22.7
21 – 50	19.8
51 – 100	7.6
101 – 250	5.9
More than 250	3.8
Geographical range of activities	(%)
Local	8.5
Regional	16.6
National	41.7
International	33.2

Moreover the vast majority (well over 80%) of the enterprises is small occupying less than 50 employees; nevertheless there are a significant number of more than 110 large companies occupying over 100 employees. Regarding the geographical range of their activities, it is mainly at national or international level obviously due to the existing competition and the dire need for increasing the turnover.

4.2. The professions' spreading

As a representative indicator of a profession's spreading in the market has been considered the employment of relevant specialized workforce in the ICT enterprises. Enterprise representatives were given the 30-item profession list yielded from the first research phase and asked whether their company employs corresponding personnel. The cumulative results produced table 2 presenting the professions' - in descending order - according to their use in the enterprises.

Table 2. Ranking of the ICT professions according to their spreading

	ICT profession	Enterprise percentage[1]
1	PC Technician	54.2
2	Network Technician	47.8
3	Programmer	47.2
4	Technical Support Manager	47.2
5	Information Technology Engineer	40.5
6	Network and Computer Systems Administrator	37.6
7	Database Analyst	37.3
8	Database Developer	37.3
9	Computer Operator	37.0
10	Information Technology Project Leader	34.4
11	Customer Service Representative	32.9
12	Applications Analyst	31.8
13	Database Administrator	29.2
14	Systems Analyst	27.1
15	Communications and Networks Engineer	26.8
16	Network Analyst	25.7
17	Web Producer	25.7
18	Operating Systems Programmer/Analyst	25.7
19	System Programmer	22.2
20	Computer and Network Security Specialist	21.3
21	Information System Services Director/Manager	21.0
22	Business Analyst	19.5
23	Information Systems Planner	19.0
24	E-Business Specialist	18.4
25	Webmaster	17.5
26	Database Security Expert	15.7
27	Computer Science Lecturer / Trainer	14.3
28	Multimedia Specialist	12.2
29	E-Publishing Specialist	6.1
30	Geographic Information System (GIS) Analyst	5.0

[1]: Percentage (%) of enterprises employing currently relevant specialist(s)

From the above analysis it becomes obvious that ICT professionals' spreading in the labour market depends very much on the particular job they exercise and can vary from 5% up to

nearly 55%. Thus, the 30 examined professions can be classified according to their presence in the market in three categories:

1) Professions with high spreading

Corresponding specialists are employed by over 40% of the companies. High spreading enjoy the first five professions of table 2.

2) Professions with medium spreading

Their relative presence frequency is between 20% and 40%. Medium spreading present over 50% of the ICT professions (16 professions of the list; from the 6th until the 21st of table 2).

3) Professions with low spreading

They are present in less than 20% of the ICT enterprises. As relatively low is considered the spreading of the last nine professions of table 2.

4.3. The capabilities for employment

The possibility of a specialist to find a relevant job is one of the principal criteria for the evaluation of his job regarding the professional prospects it offers to its practitioners. These employment possibilities are reflected by the degree of easiness or difficulty faced by the enterprises for finding specialized personnel practising each of the professions. The analysis of the corresponding answers is outlined in table 3. Table's numbers denote the percentage of enterprises representatives estimating the corresponding employment capability.

Table 3. Capabilities for employing specialized personnel in ICT professions

	ICT profession	Easy finding (%)[1]	Not easy neither difficult finding (%)[1]	Difficult finding (%)[1]
1	Database Analyst	8.0	46.7	45.3
2	Network Analyst	20.2	48.2	31.6
3	Business Analyst	17.9	34.7	47.4
4	Applications Analyst	11.9	47.6	40.5
5	Systems Analyst	14.0	45.8	40.2
6	Customer Service Representative	26.2	42.9	31.0
7	Database Administrator	20.2	52.9	26.9
8	Network and Computer Systems Administrator	20.8	52.3	26.9
9	Information System Services Director/Manager	20.4	45.2	34.4
10	Web Producer	37.3	44.9	17.8
11	Database Security Expert	4.7	35.3	60.0
12	Computer and Network Security Specialist	7.2	38.1	54.6
13	Geographic Information System (GIS) Analyst	2.0	27.5	70.6
14	Multimedia Specialist	31.6	49.4	19.0

15	E-Business Specialist	25.8	43.0	31.2
16	E-Publishing Specialist	16.7	46.3	37.0
17	Webmaster	30.7	45.5	23.9
18	Computer Science Lecturer / Trainer	42.7	40.2	17.1
19	Information Technology Engineer	40.5	42.6	16.9
20	Communications and Network Engineer	27.8	46.1	26.1
21	Programmer	37.9	42.0	20.1
22	Operating Systems Programmer/Analyst	23.4	46.7	29.9
23	Database Developer	23.6	47.9	28.6
24	System Programmer	19.4	52.7	28.0
25	Information Systems Planner	9.0	51.7	38.3
26	Network Technician	40.0	45.3	14.7
27	PC Technician	58.7	29.9	11.4
28	Information Technology Project Leader	13.8	40.0	46.2
29	Technical Support Manager	28.9	48.8	22.3
30	Computer Operator	72.3	20.4	7.3

[1]: Percentage (%) of enterprises estimating the particular degree of easiness/difficulty

The analysis of employment capabilities allows the classification of the professions according to the degree of easiness or difficulty in finding corresponding personnel for employment. Tables 4 and 5 include the 10 "easiest" and the 10 "most difficult" professions according to the existing capabilities for employing personnel respectively.

Table 4. The easiest[1] ICT professions

	ICT profession	Labour market's estimation[2] (%)	Labour market use[3] (%)
1	Computer Operator	72.3	37.0
2	PC Technician	58.7	54.2
3	Computer Science Lecturer / Trainer	42.7	14.3
4	Information Technology Engineer	40.5	40.5
5	**Network Technician**	40.0	47.8
6	Programmer	37.9	47.2
7	Web Producer	37.3	25.7
8	Multimedia Specialist	31.6	12.2
9	Webmaster	30.7	17.5
10	**Technical Support Manager**	28.9	47.2

[1]: According to the degree of easiness in finding relevant personnel for employment
[2]: Percentage (%) of enterprises estimating that it is easy to employ a relevant professional
[3]: Percentage (%) of enterprises currently using the corresponding profession

Table 5. The most difficult[1] ICT professions

	ICT profession	Labour market's estimation[2] (%)	Labour market use[3] (%)
1	Geographic Information System (GIS) Analyst	70.6	5.0
2	**Database Security Expert**	60.0	15.7
3	**Computer and Network Security Specialist**	54.6	21.3
4	Business Analyst	47.4	19.5
5	**Information Technology Project Leader**	46.2	34.4
6	**Database Analyst**	45.3	37.3
7	Applications Analyst	40.5	31.8
8	Systems Analyst	40.2	27.3
9	Information Systems Planner	39.3	19.0
10	E-Publishing Specialist	37.0	6.1

[1]: According to the degree of difficulty in finding relevant personnel for employment
[2]: Percentage (%) of enterprises estimating that it is difficult to employ a relevant professional
[3]: Percentage (%) of enterprises currently using the corresponding profession

Apart of the above classification a further analysis can be reasoned, based on the combined use of the two main professions' selection criteria; the spreading in the market and the capability for employment.

A high degree of easiness in finding personnel for employment is originally a preventive factor for practising the relevant profession. On the contrary, the extensive spreading of a particular job in the labour market gives to a professional a strong reason for its selection. Based on this syllogism the most tempting professions of table 4 are the "network technician" and the "technical support manager". They enjoy high spreading in the market, whereas finding corresponding personnel for employment is not considered as easy.

. A high degree of difficulty in finding corresponding personnel is obviously a lure for selecting it, especially if combined with relatively high spreading in the market. The most attractive professions of table 5 are the "database analyst" and the "IT project leader". Both of them present an extensive use and simultaneously a high degree of difficulty in finding corresponding personnel. Very good options are also the professions related to software or computer security ("database security expert" and "computer and network security specialist"). A high difficulty in finding these specialists is reported, whilst the fast evolution of ICT in Greece prescribes a spectacular raise of the relevant needs. This expected evolution is also anticipated by the ICT enterprises that participated in this research survey. Responding on

relevant questions of the questionnaire used, regarding the expectations for the next five-year period the labour market representatives are quite optimistic: 67.9% of them anticipate positive future for their enterprise (only 4.4% expect the opposite) and a third of them (33.1%) for sector's positive perspectives whereas only one out of ten (9.3%) foresees sector's recession. This latter prediction is contrary to their anticipation for the national economy. The corresponding prospects are rather pessimistic: only 11.7% of the respondents expect prosperity whilst 30.4% expect recession. On the other hand, the Greek ICT market is quite sure for a forthcoming raise of the demand for specialized personnel: three out of four respondents (74.8%) forecast increase. The estimated evolution of the ICT sector in Greece is expected to affect positively some professions' demand, especially the ones with high specialization.

5. Analysis of the effects

For the investigation of labour market impact on the ICT professions as problem's independent variables are considered the four main enterprise profile characteristics; namely the location, the age, the size and the range of their activities. In the next two sections are examined the effects of the independent variables on two profession parameters; their spreading in the market and the existing capabilities for finding relevant personnel. Two statistical techniques are used for this purpose. Initially the X^2 test is applied and following the Spearman's correlation coefficients (denoted as p_s, are calculated for significance levels of 95% and 99%) for all possible combinations, with the purpose to detect any existing trends. Moreover, some categorizations of the professions according to the number of significantly affecting independent variables are presented.

5.1. Effects on professions' spreading

All statistically significant effects on the professions' spreading are presented in table 6 (the numbers in bold denote impacts confirmed by both applied statistical techniques, whereas an empty cell reports the inexistence of a significant effect – in the seven professions not included in table there was not detected any significant impact). These results lead to the following conclusions regarding enterprises impact on the professions:

1) The enterprise size plays the most important role. The presence of three out of four ICT jobs (22 of the 30 examined) increases in enterprises with larger number of employees.

2) The enterprise location is not a significant factor. Only two professions ("multimedia specialist" and "e-publishing specialist") are used more by enterprises located in Attica, the prefecture of the capital Athens.

Table 6. The effects of enterprise profile characteristics on professions' spreading

		Independent variables							
		Location		**Age**		**Size**		**Range of activities**	
		X^2 test	Spearman's coefficients	X^2 test	Spearman's coefficients	X^2 test	Spearman's coefficients	X^2 test	Spearman's coefficients
	ICT profession	P	p_s	p	p_s	p	p_s	p	p_s
1	PC Technician				0,120*	**0,001**	**0,238****	**0,019**	**0,118***
2	Network Technician	0,010				**0,000**	**0,270****		
3	Technical Support Manager			**0,032**	**0,130***		0,176*	**0,046**	**0,137***
4	Information Technology Engineer					**0,001**	**0,232****		0,118*
5	Network and Computer Systems Administrator					**0,004**	**0,175***		
6	Database Analyst					**0,000**	**0,256***		
7	Database Developer					**0,000**	**0,391****		
8	Computer Operator					**0,000**	**0,335****		
9	Customer Service Representative		-0,117*			**0,001**	**0,221****		0,108*
10	Applications Analyst				0,142**	**0,000**	**0,336****		0,116*
11	Communications and Networks Engineer		-0,114*	0,007		**0,008**	**0,107***	**0,003**	**0,179****
12	System Programmer	0,027			0,170**	**0,000**	**0,285****		
13	Computer and Network Security Specialist					**0,000**	**0,371****		0,115*
14	Information System Services Director/Manager					**0,000**	**0,291****		0,111*
15	Business Analyst					**0,000**	**0,285****	**0,041**	**0,117***
16	Information Systems Planner					**0,003**	**0,219****	**0,001**	**0,166***
17	E-Business Specialist					**0,000**	**0,296****		0,111*
18	Webmaster					**0,000**	**0,252****	**0,044**	**0,153****
19	Database Security Expert				0,107*	**0,000**	**0,345****		
20	Computer Science Lecturer / Trainer	0,028		**0,015**	**0,173****	**0,000**	**0,192****	**0,019**	**-0,149****
21	Multimedia Specialist	**0,002**	**-0,167****	0,014	0,172**	**0,000**	**0,410****	**0,015**	**0,170****
22	E-Publishing Specialist	**0,047**	**-0,109***	0,002	0,206**	**0,000**	**0,307****		
23	Geographic Information System (GIS) Analyst					**0,014**	**0,107***		

p: level of confidence for X^2 test - *: $p_s < 0,05$ - **: $p_s < 0,01$

Table 7. The effects of enterprise profile characteristics on capabilities for employment

	ICT profession	Independent variables							
		Location		Age		Size		Range of activities	
		X^2 test	Spearman's Coefficients	X^2 test	Spearman's coefficients	X^2 test	Spearman's coefficients	X^2 test	Spearman's coefficients
		p	p_s	p	p_s	p	p_s	p	p_s
1	Business Analyst	0,037							
2	Applications Analyst						-0,202*		
3	Customer Service Representative					**0,003**	**-0,344****		
4	Systems Analyst								-0,293**
5	Computer Science Lecturer / Trainer						-0,240*		
6	Information Technology Engineer				-0,174*				
7	Communications and Networks Engineer	0,042							
8	Programmer						-0,179*		
9	Database Developer						-0,189*		
10	System Programmer						-0,236*		
11	Network Technician						-0,172*		
12	PC Technician					**0,044**	**-0,246****		
13	Information Technology Project Leader					0,036			
14	Technical Support Manager	**0,039**	**0,194***			**0,039**	**-0,187***		-0,153*

p: level of confidence for X^2 test - *: $p_s < 0,05$ - **: $p_s < 0,01$

3) The impact of enterprise age is low. Merely four professions ("technical support manager", "computer science lecturer/trainer", "e-publishing specialist" and "multimedia specialist") present augmentative presence in older companies and in four others emerge similar trends not confirmed by both applied statistical tests.

4) The geographical range of companies' activities affects the use of eight ICT professions. The presence of seven of them is greater in enterprises activating at international or national level (table 10), whereas the "lecturer/trainer" is used more by locally acting companies.

5.2. Effects on capabilities for finding specialized personnel

The parallel application of two statistical techniques revealed a few significant results regarding the effects of enterprises profile on their capabilities for finding specialized personnel. Only 7 - of the totally 120 combinations - gave a value less than 0.05 in X^2 test, whereas 13 scattered statistically significant Spearman's correlation coefficients were found (table 7). The sole effects confirmed by both applied statistical tests are the following:

1) Small enterprises as well as those residing in the province face greater difficulties than larger and central ones respectively in finding "technical support managers".

2) It is more difficult for small companies to find "customer service representatives" and "PC technicians" for employment.

Besides, a careful observation of table 7 shows that large companies seem to find easier specialists in six more professions related mainly to computer programming and education. The remaining very few statistically significant Spearman's coefficients are detached and do not prove any existing impact.

5.3. Professions' categories

The analysis of the effects of enterprise profile characteristics on the professions allows their categorization according to the number of the independent variables affecting significantly their presence in the market. Thus, the ICT professions can be classified in the following categories:

1st category of ICT professions (7 jobs; table 8):

Their presence in the market is uniform, not being affected by any of the enterprise profile characteristics.

Table 8. ICT professions with uniform spreading

	ICT profession
1	Network Analyst
2	Systems Analyst
3	Database Administrator
4	Web Producer
5	Programmer
6	Operating Systems Programmer/Analyst
7	Information Technology Project Leader

2nd category of ICT professions (13 jobs; table 9):

Their spreading is affected only by the enterprise size. ICT companies with large number of employees use them more.

Table 9. ICT professions with greater use in large enterprises

	ICT profession
1	Data Base Analyst
2	Applications Analyst
3	Customer Service Representative
4	Network and Computer Systems Administrator
5	Information System Services Director/Manager
6	Database Security Expert
7	Computer and Network Security Specialist
8	Geographic Information System (GIS) Analyst
9	E-Business Specialist
10	Information Technology Engineer
11	Database Developer
12	Network Technician
13	Computer Operator

3rd category of ICT professions (7 jobs; table 10):

Their presence in the labour market is affected by two enterprise profile characteristics. The first two jobs of table 10 present greater use in larger and older companies and the next 5 in larger and with wider (international or national) geographical range of activities companies.

**Table 10. ICT professions with greater use spreading
in large and old[1] or internationally activating enterprises[2]**

	ICT profession
1	System Programmer[1]
2	Technical Support Manager[1]
3	Business Analyst[2]
4	Webmaster[2]
5	Communications and Network Engineer[2]
6	Information Systems Planner[2]
7	PC Technician[2]

[1]: Greater use in larger and older enterprises
[2]: Greater use in larger and internationally activating enterprises

4th category of ICT professions (2 jobs):

Their use is affected by three enterprise profile characteristics:

1) Older, larger and locally activating companies employ "Computer science lecturers/trainers" more.

2) "E-publishing specialists" are employed more by central (located in the region of Athens), larger and internationally activating companies.

5th category of ICT professions (1 job):

The spreading of this job is affected by all main enterprise profile characteristics. Central, large, old and internationally activating companies employ more "multimedia specialists".

Some high specialization professions such as "GIS analyst", "data base security expert" and "computer and network security specialist" (having presently relatively low spreading of 5%, 15.7% and 21.3% respectively) present further interest regarding the examination of their future prospects. Despite the inability for a safe prediction, there are some indications for a promising career of the relevant specialists in Greece. These indications are mainly based on the declared opinions of the enterprise representatives participating in this survey: a) 70.6%, 60% and 54.6% of them respectively consider that these jobs present the highest difficulty for finding corresponding representatives for employment (table 5), b) responding **on** a relevant question 72.6% of the enterprises anticipate that the degree of specialization of the ICT personnel will be increased (whereas just 4.4% expect reduction) and c) the spreading of these professions is significantly greater in larger enterprises (table 6); an additional positive sign as the

tendency for increase of enterprise size is already visible in most EU countries. If these indications will be confirmed in the future, they might result to significant changes of some of the professions' categories introduced here.

6. Concluding remarks and practical implications

This paper was concentrated on the analysis of the information and communications technologies' professions. Relevant first-born data including labour market representatives' opinions were collected through a national survey on ICT enterprises, yielding 343 filled and valid questionnaires. The analysis focused on two main issues: a) the professions' spreading in the market and the capabilities for employment of the corresponding specialists and b) the detection of the effects of the enterprise profile characteristics on them. Finally, some categorizations of the ICT professions according to their spreading and to the number of the significantly affecting characteristics were attempted.

It has been found out that the use of the various ICT professions in the labour market presents significant differentiations allowing their allocation in three distinct categories of high, medium or low spreading (with presence in over 40%, in between 20% and 40% and in less than 20% of the enterprises respectively). Moreover, the degree of easiness or difficulty for finding specialized personnel for employment depends significantly on its specialization. The combined consideration of this "employment degree" and of the profession's spreading in the market gives a credible criterion for effective job selection. Six of the totally 30 examined professions correspond to the most favourable combinations and can be suggested to the young professionals as the ones with the lowest unemployment risks. These jobs are related to technical support (technical support manager or network technician), management (IT project leader), security (computer and network security specialist or database security expert), databases (database analyst), and offer to their practitioners better professional prospects.

The examination of the impacts of the enterprise characteristics on the professions has shown relatively low statistically significant effects. Nevertheless, regarding job seeking, ICT specialists should in general prefer applying to large enterprises which use more professions and have therefore more possibilities of being needed and consecutively employed. Specialists practicing certain professions should also take into account the geographical range of activities and secondarily the age of the candidate employing companies. Looking at this problem from labour market's view, the enterprise profile characteristics do not play an important role on their capabilities for finding specialized personnel.

Regarding future relevant research, the experience gained from the conducted survey has given some relevant suggestions. The accomplishment of a future survey at international level giving emphasis in comparing results of countries with common socioeconomic characteristics or geographical proximity would present substantial interest. Member-states of the European Union or the Balkan countries form two suitable examples. Furthermore the examination of future alterations of the spreading and demand of high specialization professions and the possible resulting changes of the favorable ICT professions would also be an interesting issue. The results as such an investigation could affect and possibly alter the categorization of the sector's professions.

Concerning the methodology adopted, it would be also interesting to use a different research tool rather than a quantitative one, such as a questionnaire. The use of personal interviews with sector's employers and/or employees, despite the practical inability of examining large samples, would allow the investigation of more parameters of the multidimensional issue of the ICT professions.

References

Armstrong J. S. and Lusk E. J. (1987), "Return postage in mail surveys", *Public Opinion Quarterly*, 51, 233-248.

Communautés Européennes (1990), *Nomenclature générale des activités économiques dans les Communautés Européennes*.

Farr, M. and Ludden L (1999), *Best jobs for the 21st century,* Indianapolis: JIST Works.

Fowler, F. J. (1993), *Survey research methods,* 2nd edition, Newbury Park, California: Sage Publication.

Fowler, F. J. (1995), *Improving survey questions: Design and evaluation,* Thousand Oaks, CA: Sage.

Greek Computer Society (1996), "*Development of qualifications/tasks index for professionals in information and telecommunications technologies of the public sector*", Athens.

Katsanevas T. (1998), "*Professions of the Future*". Athens: Papazisis publications.

Katsanevas T. (2002) "Professions of the future and of the past: professions prospects in 13 prefectures and career orientation", Athens: Patakis publications.

Klimopoulos S., Giziakis K., Xouvardas B., Kehagias D., Bardi E. and Reizis, N (2001), "*Investigation Study of the Labour Market with Respect to the Demand of Universities and Technological Educational Institutions Specialties*".

Kostoglou, V. (2002), *Operational research: methodology - applications and problems-management information systems,* Thessaloniki: Tziolas publishing co., 37-75.

Kostoglou V. and Paparrizos K. (2003), "Occupation areas, specialization sectors and professions in ICT: An overall analysis and selection methodology", *Proceedings of the 9th Pan-Hellenic Conference of the Greek Computer Society*, Thessaloniki, Greece, 310-321.

Kostoglou V., Paparrizos K. and Zafiropoulos C. (2004a), "Investigating human resource management in ICT labour market", *Operational Research an International Journal*, 4(1), 57-72.

Kostoglou, V., Koutroukis, T. and Paparrizos, K. (2004b). ICT graduate programmes in Greece: Analysis and association with the labour market. *Proceedings of the Global Integration of Graduate Programmes (GIGP) 2004 International Conference,* 97-104. Amman, Jordan.

Linsky A. (1975), "Stimulating Responses to mailed qquestionnaires: A review", *Public Opinion Quarterly*, 39, 82-101.

National Statistical Service of Greece (1995), *"Statistical Classification of Professions STEP – 92",* Athens.

New Horizons. (2002), *"Your IT future"*, Retrieved from the World Wide Web: http://www.youritfuture.com/english/index.asp.

Northwest Center for Emerging Technologies - NWCET (1999), *"Building a foundation for tomorrow, Skills standards for information technology"*.

Oppenheim A. N. (1966), *Questionnaire design and attitude measurement*, London: Heinemann

Pacel, D. J. (1971), "Questionnaire follow-up returns as a function of incentives and respondent characteristics", *Vocational Guidance Quarterly,* 19, 188-193.

Schegelmilch, B. B. and Diamantopoulos, S. (1991), "Prenotification and mail survey response rates: A quantitative integration of the literature", *Journal of the Market Research Society,* 33, 243-255.

Siskos Y., Krassadaki L., Karagounakis A. and Fortsas V. (2003), "*Vocational training and computer glossaries*", Technical University of Crete, DSS Laboratory-ERGASYA, Retrieved from the World Wide Web: http://www.astrolavos.tuc.gr.

US Ministry of Labor (1998), *"O*NET – The Occupational information network"*.