

Tsagala, E. and Kordaki, M. (2005). Essential Factors that Affect Students' Choices to Study Computer Science: Gender Differences. *7<sup>th</sup> International Conference for Computer Based Learning in Science*. (pp. 541-552), Zilina, Slovakia, 2005.

## **ESSENTIAL FACTORS THAT AFFECT STUDENTS' CHOICES TO STUDY COMPUTER SCIENCE: GENDER DIFFERENCES**

Evrikleia Tsagala and Maria Kordaki

### **ABSTRACT**

In this paper, an essential aspect regarding the multilateral issue of under-representation of women in Computer Science (CS) is presented. It is based on research conducted with a sample of 77 students aged 17, 52 of which were girls. These students were about to decide on their future undergraduate studies. The goal of this study was to determine the factors affecting the decisions of both girls and boys whether or not to pursue undergraduate computer courses. Questionnaires were used, addressing issues in the following 4 main categories: a) the reasons students chose/chose not to study CS, b) the way students' family and friends, the media and the school environment contribute to their decision, c) the students' perception of their prospective future after studying CS and d) the students' perception of the gender that better fits the profile of a computer scientist.

The results were quite illuminating: a) more boys than girls choose to study CS. Boys and girls choose/choose not to study CS because they find/don't find it an interesting subject and because of the employment opportunities rate of the CS industry. Motivation in choosing to study CS differs between boys and girls: the former are motivated by their former experience in using computers whereas the latter are mainly motivated by the employment opportunities of the CS industry: b) the surrounding social environment in terms of family, school, friends and media seemed to affect student choice of undergraduate studies in CS through communication, infrastructure and living examples: c) boys imagine themselves as computer scientists in a competitive and profitable job in the industry whereas girls emphasized that they would prefer permanency in their future jobs and are not overly concerned about the payment: d) regarding the profile of a computer scientist, a small percentage of boys expressed the opinion that men more than women suit this kind of profession, whereas almost all the girls stated that they find both men and women suitable.

### **KEYWORDS**

Computer Science, Gender Differences, Secondary Education, Undergraduate Studies

### **INTRODUCTION**

Computer Science is one of the most important and fast developing fields in Science. While the scale of the impact of Computer Technology on human activities, not to mention almost every other aspect of human life, is difficult to determine, it is undoubtedly constantly on the increase as more and more products are launched. Moreover, given the fact that modern living has made the use of computers an indispensable aspect of working and studying, it is now essential to examine whether computer technology is democratically shared: is it approachable to everyone who needs to use it?

Nowadays, not only are more men than women actively involved with computers but many believe that it is more natural for men to study Computer Science than for women (Galpin, 2002; Gürer and Camp,

2002). Thus, it is crucial to address the important phenomenon that women are underrepresented in all fields of Computer Science: undergraduate and graduate studies (Galpin, 2002; Wardle and Burton, 2002), Computer Science Industry (Duplantis, MacGregor, Klawe and Ng, 2002) and Computer Science Academic field (Camp, 1997; Moskal, 2002).

In actual fact, active involvement by women in the world of computers dates from the early 19<sup>th</sup> century, where women more than men were occupied with these machines because of their experience in typing and telephony (Lee, 2002). In addition, there are many remarkable women who have made their mark in the history of computing with their great achievements (Gürer, 1995). Despite this, female Computer Scientists have been treated - and sometimes still are - as inferior scientists when they cooperate with their male counterparts, not to mention the fact that many people believe that men are more capable of using a computer than women (Gürer and Camp, 2002).

Although the factors that contribute to low participation of women in the field of Computer Science are various and difficult to determine, many studies (Clayton and Lynch, 2002; Cohoon, 2002; Fisher and Margolis, 2002; Jepson and Perl, 2002; Lazowska, 2002; Moskal, 2002) have been conducted, with very illuminating results. The main reason women are not actively involved with computers can be traced back to their early years (Klawe, 2002): the male orientation of computer games (Duplantis, MacGregor, Klawe and Ng, 2002; Johnson and Miller, 2002; Kiesler, Sproull and Eccles, 1985). Boys more than girls find computer games a very attractive source of fun, as the content is representative of their culture (Pearl, Pollack, Riskin, Thomas, Wolf and Wu, 1990): guns, war, fights, aggressive scenes, male figures, vivid sounds and graphics. Consequently, girls who do not enjoy this kind of entertainment (Gürer and Camp, 2002) will not gain experience with computers in their childhood and grow up in the belief that computers are “a boys’ thing” (Balcita, Carver and Soffa, 2002). Many researchers (Pearl, Pollack, Riskin, Thomas, Wolf and Wu, 1990; Teague, 2000) claim that the fact that, during their childhood and school years, girls do not gain as much experience with computers as boys do is an important factor in discouraging them to decide on taking a Computer Science major.

Diminished female self-confidence in using computers is another essential reason that causes low female participation in Computer Science (Gürer and Camp, 2002). The most harmful factors causing this low self-confidence are: a) discrimination, both within the classroom, as CS teachers rarely interact with female students (Gürer and Camp, 2002; Lazowska, 2002) and within the family, for example by placing the family P.C. in the boy’s room (Balcita, Carver and Soffa, 2002) as well as within the working environment (Pearl, Pollack, Riskin, Thomas, Wolf and Wu, 1990; Teague, 2000); b) lack of encouragement in school (Gürer and Camp, 2002) and at home (Countryman, Feldman, Kekelis and Spertus, 2002) in using computers or even studying Computer Science; c) limited access to computers or computer games in both schools (Countryman, Feldman, Kekelis and Spertus, 2002; Jepson and Perl, 2002), as boys tend to dominate in computer laboratories (Gürer and Camp, 2002), and video arcades (Kiesler, Sproull and Eccles, 1985); d) the hostile and uncomfortable atmosphere created by boys when they participate in computing activities (Gürer and Camp, 2002). Student self-assurance with computers is essential when they are about to decide on their studies (Gürer and Camp, 2002).

The media also contribute to the formation of a CS stereotype (Fisher and Margolis, 2002; Jepson and Perl, 2002; Klawe, 2002): men more than women are presented using computers (Cohoon, 2002; Duplantis, MacGregor, Klawe and Ng, 2002; Johnson and Miller, 2002; Lazowska, 2002), usually appearing to be myopically focused on their P.C. and lacking in other social interests (Klawe, 2002). More than this, a negative impression is promulgated through the media concerning the demands of a job in the Computer Science Industry (Gürer and Camp, 2002), work isolation and the long and stressful working hours (Duplantis, MacGregor, Klawe and Ng, 2002; Lazowska, 2002). These are characteristics that women do not appreciate when choosing studies or a career.

In addition, the lack (Balcita, Carver and Soffa, 2002; Lazowska, 2002; Pearl, Pollack, Riskin, Thomas, Wolf and Wu, 1990) of successful women as mentors and role models in the field of CS, all levels of

education, the Computer Science Industry and society in general, has a negative psychological effect on some women during the course of their studies, often leading them to drop out.

As far as the working environment of Computer Science is concerned, it is also observed that women have different potential job expectations that conflict with their beliefs of what a Computer Science job entails (Clayton and Lynch, 2002; Craig, Paradis and Turner, 2002; Duplantis, MacGregor, Klawe and Ng, 2002; Jepson and Perl, 2002). Additionally, their priorities are quite different from those of men, who are not so greatly concerned about creating a family as they are about their career and professional progress (Jepson and Perl, 2002; Johnson and Miller, 2002; Pearl, Pollack, Riskin, Thomas, Wolf and Wu, 1990; Teague, 2000). Moreover, the male-dominated world of Academia (at least in terms of CS Departments) appears to be blocking women from continuing their studies at a doctoral or even postgraduate level (Cohoon, 2002; Güreer and Camp, 2002; Lazowska, 2002).

With the above in mind, it is clearly important to determine the ways in which gender differentiation affects the choice of whether or not to take Computer Science as a major. It seems that girls make professional choices regarding CS in a different way to boys. One hypothesis is that boys' choices are mainly influenced by their relation with computers (Huff, 2002), as they widely bring into play computer games (Klawe, 2002). Regarding girls' choices, the most popular reasons schoolgirls do not usually find Computer Science an interesting subject to study are: "Not enough role models", "Women have other interests", "Don't know about the industry", "Limited opportunity", "Negative media" and "Too nerdy" (Jepson and Perl, 2002). It has also been ascertained that, in certain countries, girls are less likely to build a relationship with computers strong enough to urge them to take a Computer Science major; needless to say, not only are the reasons explaining this phenomenon irrelevant to the female cultural background, but it seems that girls are also not well-informed about the Computer Science world (Galpin, 2002).

Despite the fact that many researchers focus on the specific reasons that cause women's low participation in CS, surveys on the gender differences in student career choices regarding Computer Science have not yet been reported.

The aim of this article is to investigate: a) the factors affecting the decisions of both boys and girls to take/not take Computer Science as an undergraduate study major: b) the dissimilar impact of crucial factors (e.g. family, school environment, friends and media) on these decisions: c) student perceptions of Computer Science.

The article is organised as follows: "The Context of the Study" presents details about the way the research was conducted, referring to the study sample and the methodology followed; "The Results" gives a full description of the upcoming results of the research, illustrated with pertinent diagrams; the "Discussion" section, categorizing the responses along with our interpretations. Overall conclusions of the article are summarized in the "Conclusion" section, while concluding remarks and proposals for future research work are to be found in the final section, "Open Issues and Future Directions".

## **THE CONTEXT OF THE STUDY**

The focus of the survey was to investigate through eight (8) suitably chosen questions the conceptions of both girls and boys regarding the following issues:

- The reasons girls and boys chose/chose not to take Computer Science as an undergraduate course
- The role played by family, school, friends and media in the students' decisions
- Students' prospective future after studying CS
- Student perceptions of the profile of a Computer Scientist.

The study was conducted on February 2004, in a typical provincial high school located in Patras, Greece. The questionnaires were given to a sample consisting of 77 students - 52 females, 25 males - all aged seventeen (17). At this age, all Greek students have to make a crucial choice regarding their undergraduate studies; specifically, this involves selecting which Science is interesting for them to study. From a methodological point of view, this study was based on phenomenography (Marton, 1988), where student responses rather than their thinking are the focus of study. Student responses were carefully classified in order to depict their perceptions as accurately as possible. The results are presented in the form of comparison between the different female and male opinions.

## RESULTS

Each of the questions included in the questionnaire used is presented below, along with the results of the survey. Our interpretations regarding these specific results are also presented.

**1<sup>st</sup> question:** “Do you intend to study Computer Science?”. This question aimed to determine the percentage of boys and girls who were willing to study Computer Science. Table 1 gives the number and percentage of both boys and girls who answered “YES” or “NO” to this query, together with the Total number of male and female students.

Table 1. Number of students willing/unwilling to study Computer Science

	BOYS (25)		GIRLS (52)	
	Number (N1)	Percentage (N1/25)%	Number (N2)	Percentage (N2/52)%
<b>YES</b>	12	48	15	29
<b>NO</b>	13	52	37	71

These data show that a high proportion of boys (48%) intend to study Computer Science compared to the low proportion of girls (29%). What is more, almost half the boys will chose a CS career, whereas only two-sevenths of the girls will do the same.

**2<sup>nd</sup> question:** “What are the reasons for your choice?”. This question attempts to reveal the motives behind boys and girls choosing to take/not to take CS studies. In the following table (Table 2) the reasons that the students give for not choosing to study CS are shown, while in Table 3 the reasons mentioned by the students who chose to study CS are presented, together with comparison of girls’ and boys’ answers. The number of girls and boys who expressed each reason and the respective percentages are also presented in both Tables.

Table 2. Reasons why boys and girls **will not chose** to study CS

REASONS NOT TO STUDY CS	BOYS (13)		GIRLS (37)	
	Number (N1)	Percentage (N1/13)%	Number (N2)	Percentage (N2/37)%
<b>Limited Interest in the Subject</b>	10	77	32	86,5
<b>Difficulty to Enter a CS School<sup>1</sup></b>	4	31	3	8
<b>Limited Access/Experience in Using Computers</b>	3	23	3	8
<b>Low Performance in Mathematics</b>	-	-	3	8
<b>CS Profession’s Characteristics</b>	-	-	2	5,5

<sup>1</sup> In Greece, all high school students take examinations in order to enter University. Depending on their grades, they enter one of the schools they have previously registered. Computer Science departments are among the most competitive and demanding in Greece, in terms of grades required.

From the above, it can be said that the most important factor discouraging both boys and girls from choosing Computer Science as a major is lack of interest in the subject and here it is worth noting the correspondingly high percentage of girls who responded. A respectable percentage of the boys claimed that difficulty in gaining a place at CS Schools and their limited experience in operating computers were deterrent factors. As for girls, a small percentage stated the aforementioned reasons, adding that low performance in Mathematics and some characteristics of the CS profession (such as long and demanding working hours, working before a computer screen and specialization) also affected their choice.

Table 3. Reasons why boys and girls **will chose** to study CS

REASONS TO STUDY CS	BOYS (12)		GIRLS (15)	
	Number (N1)	Percentage (N1/12)%	Number (N2)	Percentage (N2/15)%
<b>Increased Interest in the Subject</b>	9	75	10	66,66
<b>Employment Opportunities of CS Profession</b>	6	50	11	73,33
<b>Experience in Using computers</b>	6	50	2	13,33
<b>Financial Gain</b>	1	8	-	-
<b>Prestigious Profession</b>	1	8	-	-
<b>Importance of Technology</b>	-	-	3	20
<b>Profession with Prospects</b>	-	-	1	6,66

A large percentage of boys and girls chose to study CS because they find it an interesting subject. Girls are far more interested than boys in gaining job security, whereas a much higher percentage of boys than girls assume that their experience in using computers is a good reason to study CS. Secondary reasons for boys are the financial gain to be had from working in a CS profession, as well as the prestige of this profession. Girls are urged to study CS to a greater extent by the fact that computers are technology of importance than by their personal experience in using computers.

**3<sup>rd</sup> question:** “*Did your parents urge you to choose a Computer Science-related profession?*”. This question aimed to expose the influence of the family on boy’s and girls’ decisions to take CS as a major.

Table 4. **Family Influence** on boys’ and girls’ decisions whether or not to choose CS as a major

STATEMENTS		BOYS (25)		GIRLS (52)	
INFLUENCED		Number (N1)	Percentage (N1/25)%	Number (N2)	Percentage (N2/52)%
		8	32	17	33
<b>Positively</b>	<b>Job Security</b> (Through Discussion)	3	12	5	9,6
	<b>Providing Infrastructure</b> (PC, courses, etc)	2	8	2	3,8
	<b>Emphasizing Financial Gain</b> (Through Discussion)	1	4	1	2
	<b>Importance of Technology</b> (Through Discussion)	1	4	3	5,8
	<b>Other Member of the Family Used Computers</b>	1	4	4	7,7
<b>Negatively</b>	<b>Girls Not Suitable For These Studies</b> (Through Discussion)	-	-	2	3,8
<b>NOT INFLUENCED</b>		17	68	35	67

Table 4 shows the way (in terms of statements) boys and girls consider their family influences their choice of CS studies and the number and percentage of students who expressed each statement. Due to the fact that the number of students that expressed family influence is low, it is risky to generalize here.

From the data above, it seems that the majority of students are not explicitly affected by their families. These data also show that family affect the decisions of both girls and boys in equal measure. The ways that family affect student decisions are: a) communication within the family, b) the infrastructure provided and c) living examples of family members. More specifically, the family gives the impression of exercising greater pressure on boys than on girls to choose a CS related profession, because of the employment opportunities rate the CS field presents. Moreover, parents appear to provide their sons more than their daughters with computers and related activities (courses). Families also appear to be more worried about financial security for boys than for girls. Girls appear to be more influenced than boys by parental advice in terms of studying CS when they see other family members using computers effectively or studying CS and because they see computers as a technology of importance. Finally, it is worth noting that only girls are negatively influenced.

4<sup>th</sup> **question:** “*Did school give you motives to follow a CS-related profession?*”. The goal of this question was to investigate the way school contributed to choosing or not choosing CS studies. The following table (Table 5) presents the motives and anti-motives school provided for its students. Table 5 shows the way (in terms of statements) boys and girls consider school influences their choice of whether or not to take CS studies and the number and percentage of students who expressed each statement.

Table 5. Motives and Anti-motives **School** provided for boys and girls

STATEMENTS		BOYS (25)		GIRLS (52)	
		Number (N1)	Percentage (N1/25)%	Number (N2)	Percentage (N2/52)%
<b>INFLUENCED</b>		2	8	9	17,3
<b>Motives</b>	<b>Teachers' Recommendations</b>	1	4	1	2
	<b>Infrastructure/Relative Courses</b>	-	-	4	7,7
<b>Anti-Motives</b>	<b>Limited Infrastructure/Access</b>	1	4	1	2
	<b>Insufficient Information about CS</b>	-	-	2	3,8
	<b>Uninspiring Teachers</b>	-	-	1	2
<b>NOT ANSWERED</b>		23	92	43	82,7

Due to the fact that very few students answered this question, generalizations are unsafe. The number of girls influenced by the context of school is twice that of the corresponding number of boys. Students also stated that there is a balance between the motives and anti-motives that school provides. As far as motives are concerned, we see that the fact that professors urge students to study CS and the fact that school provides adequate infrastructure are motives for the vast majority of both boys and girls who answered. On the other hand, some boys and girls find the school infrastructure inadequate. However, only girls claimed that the information given by the school environment about Computer Science is limited and that they don't find their CS professors inspiring enough to follow in their footsteps.

5<sup>th</sup> **question:** “*Did your friends' environment influence you so as to choose a CS-related profession?*” This question attempts to evaluate peer pressure as a factor in choosing whether or not to take CS studies. Table 6 presents the statements boys and girls made and the number and percentage of students who made each statement. From this table, one can assume that boys are far less influenced by their friends than girls are. More specifically, although boys and girls are positively influenced in equal measure by their friends' interest in CS, boys do not claim to be affected negatively by their friends'

lack of interest in CS, whereas girls will not use or study computers if they see their friends doing the same. Girls seem to be as much negatively affected as positively influenced by friends' interest in the subject. They are also affected by discussion of the job security CS professions provide.

Table 6. Influence of **Friends** regarding CS studies

STATEMENTS		BOYS (25)		GIRLS (52)	
		Number (N1)	Percentage (N1/25)%	Number (N2)	Percentage (N2/52)%
<b>INFLUENCED</b>		1	4	8	15,3
<b>Positively</b>	<b>High Interest of friends in CS</b>	1	4	2	3,8
	<b>Job security (Through Discussion)</b>	-	-	4	7,7
<b>Negatively</b>	<b>Low Interest of friends in CS</b>	-	-	2	3,8
<b>NOT ANSWERED</b>		24	96	44	84,7

**6<sup>th</sup> question:** “*In what ways did the Media affect your choice of a CS-related profession?*” The aim of this query was to examine the influence of the Media on boys’ and girls’ decisions regarding CS. The Table below gives students’ answers (in terms of statements) and the corresponding number and percentage of students who made each statement.

Table 7. **Media** Influence on taking CS studies

STATEMENTS		BOYS (25)		GIRLS (52)	
		Number (N1)	Percentage (N1/25)%	Number (N2)	Percentage (N2/52)%
<b>INFLUENCED</b>		1	4	6	11,5
<b>Advertisements/ Promotion of Computer Technology</b>		1	4	3	5,7
<b>Information About Jobs in CS</b>		-	-	3	5,7
<b>NOT ANSWERED</b>		24	96	46	88,5

From the above data, we can presume that girls are more influenced than boys by the media. In particular, more girls than boys are influenced by media advertising, and girls also pay attention to the information about jobs the Computer Science Industry media provide.

**7<sup>th</sup> question:** “*How do you imagine your future after studying Computer Science?*”. This question intended to identify the conceptions boys and girls had of their prospective future supposing they were to study CS. Table 8 shows the results.

Table 8. Prospective **future** for Boys and Girls after studying CS.

STATEMENTS		BOYS (25)		GIRLS (52)	
		Number (N1)	Percentage (N1/25)%	Number (N2)	Percentage (N2/52)%
<b>ANSWERED</b>		12	48	15	28,8
<b>Great Career in CS</b>		4	16	4	7,7
<b>Financial Gain</b>		4	16	1	2
<b>Working in the Industry</b>		2	8	2	3,8

<b>CS Diversity: Employment Prospects</b>	1	4	-	-
<b>CS Diversity: Employment Difficulties</b>	-	-	2	3,8
<b>Job Security</b>	1	4	3	5,7
<b>Public Sector Employment</b>	-	-	3	5,7
<b>NOT ANSWERED</b>	13	52	37	71,2

We can see that more boys than girls imagine a great career in the CS Industry with financial gain, whereas girls are interested in having a career mainly as a way to attain job security (Public Sector) rather than financial gain. Additionally, boys find Computer Science diversity an attractive challenge, whereas the same characteristic makes girls regard it as a demanding profession.

**8<sup>th</sup> question:** “Do you believe that a Computer Science related profession suits both men and women equally?”. The goal of this question was to extract from the students their perceptions of the profile of a Computer Scientist. Table 9 depicts the answers of both boys and girls.

Table 9. Perceptions of boys and girls of the profile of a Computer Scientist

	<b>BOYS(25)</b>		<b>GIRLS(52)</b>	
	Number (N1)	Percentage (N1/25)%	Number (N2)	Percentage (N2/52)%
<b>ANSWERED</b>	22	88	47	90,4
<b>Yes</b>	14	56	44	84,6
<b>No</b>	8	32	3	5,7
<b>NOT ANSWERED</b>	3	12	5	9,6

Almost half the boys who answered this question (14 out of 22) and most of the girls (44 out of 47) believe that a profession related to Computer Science suits both men and women. A respectable percentage of boys believe that men are better fitted to this kind of profession, while correspondingly few girls believe that women are suited to this kind of work.

## DISCUSSION

The relationship between gender differentiation and the decisions that girls and boys of secondary level education make when choosing whether or not to take Computer Science as a major is the core of this study. Essential issues that were addressed by exploring these decisions through the analysis of the data collected are presented and discussed below:

i) Gender differentiation and the choice of Computer science as a major; ii) The role of the social environment in student decision making: family, school, friends and media; iii) Students’ perceptions of their prospective futures after studying CS and iv) Students’ perception regarding the gender that best fits the profile of a Computer Scientist.

i) *Gender differentiation and the choice of Computer science as a major.* Considerably more boys than girls expressed their decision to be candidates for undergraduate level Computer Science Education (65% more boys than girls). The most important reasons that *positively affect* girls’ and boys’ decisions are: a) increased interest in CS as a subject of study and b) employment opportunities in the CS profession. In addition, boys’ experience with computers positively affects their decisions while the challenge of CS as a technology of importance has a great influence on girls’ decisions. More girls than boys focus on job security (50% more girls than boys) while more boys than girls focus on their experience with computers (4 times more boys than girls).

The most important reasons that *negatively affect* the boys’ choices are: a) decreased interest in CS as a subject of study, b) limited access/experience in using computers, and c) difficulty in gaining an undergraduate place in a CS department. Girls are *negatively* influenced mainly because they view CS as being an uninteresting major.



ii) *The role of social environment on students' decisions: family, school, friends and media.* Family seem to affect both girls and boys equally (30%) but in different ways. The ways that parents affect their children's decisions are: a) communication within the family, b) the infrastructure provided and c) living examples of family members. More specifically, family values in terms of job security, financial gain and needful work seemed to influence students' decisions. Parents seemed to encourage their children to choose CS as a major by linking these values to CS-oriented jobs. Here, it is worth mentioning that a number of parents discourage their daughters from choosing CS as a major by labeling it 'not suitable for girls'. In addition, the provision of an appropriate infrastructure seems to play a significant role on the decisions of both boys and girls, while parents appear to provide their sons more than their daughters with computers and related activities (twice as many boys as girls). Finally, living examples of family members who use computers effectively or study/have studied CS seemed to affect more girls than boys positively (twice as many girls as boys).

The context of school seemed to provide motives and anti-motives used by the students as arguments for choosing or not choosing to study CS as a major. The most essential motives and anti-motives that students stated are: a) the teacher as mentor or not and b) the school's infrastructure (adequate or not). School seemed to influence the decisions of more girls than boys (twice as many girls as boys).

Friends also seemed to play the role of mentors by expressing: a) their high/low interests regarding CS and b) the opinion that there is a strong relationship between job security and CS. More specifically, friends' high interest in CS seemed to affect the decisions of both girls and boys positively while girls seemed to be negatively influenced by the lack of interest of their friends. On the whole, friends seemed to affect more girls' than boys (4 times as many girls as boys).

The Media seemed to influence more girls than boys (3 times as many girls as boys) through a) advertisements promoting Computer Technology and b) the information about jobs the Computer Science Industry that the media provide (girls seemed to pay more attention to this information).

Based on the above, we can state that more girls than boys tend to be affected by the surrounding social environment and more specifically by the encouragement /discouragement of their: parents, teachers, friends and media. This encouragement /discouragement can be in the form of: a) the positive/negative image of a Computer Scientist that is projected and b) the adequate/inadequate infrastructure provided. The positive/negative image of a Computer Scientist seemed to be projected by: a) communication and b) living examples that may or may not play the role of mentors.

It is worth noting that the impact of the social environment on the students' decisions presented here has been based on the analysis of their responses to the corresponding items in the questionnaire. The fact that a considerable number of students did not answer the corresponding questions may mean that those responses that were given do not accurately reflect student thinking. It is possible that a number of students have little or no awareness of the factors that actually affect their decisions regarding their choice of undergraduate studies.

iii) *Students' perceptions of their prospective future after studying CS.* Based on the results of this study, we can state that more boys than girls imagine their prospective future after studying CS as a profitable career in the CS Industry. Only girls expressed an interest in a CS-career mainly to attain job security (Public Sector) and not for financial gain. Additionally, boys find Computer Science diversity an attractive challenge, while the same characteristic leads girls to regard it as a demanding profession.

iv) *Students' perception regarding the gender that best fits the profile of a Computer Scientist.* Almost half the boys and most of the girls believe that a profession related to Computer Science suits both men and women. A respectable percentage of boys (32%) believe that men are better suited to this kind of profession, while few girls are of the opinion that women are better suited to this kind of work.

On the whole: more boys than girls choose to study CS. Basic motivators for boys were: interest in CS as a subject, employment opportunities, great career in the Industry, financial gain and experience with computers. Basic motivators for girls were: interest in CS as a subject, job security and good living examples such as charismatic teachers, successful family members in CS and mentors projected by the media.

## CONCLUSIONS

In this paper, gender differentiation and the choice of whether or not to study Computer Science as a major has been presented. The role the social environment - in terms of family, school, friends and media – plays in student decision making is also studied. Student perceptions of their prospective futures after studying CS have been also investigated. Moreover, student perceptions of the gender that best fits the profile of a Computer Scientist have been examined.

The results are quite illuminating: more boys than girls choose to study CS. Boys and girls mainly choose/do not choose to study CS because they find it an interesting/uninteresting subject to study. Employment opportunities are also a significant motive for both girls and boys. Boys are also motivated/ unmotivated by their former experience/inexperience in using computers while the challenge of CS as a technology of importance has a significant influence on girls' decisions. Boys and girls seemed to be equally affected by their families while more girls than boys seemed to be affected by school, friends and media. The ways that the social environment seemed to affect both girls and boys are: communication, the infrastructure and living examples. Basic factors in the social environment that positively affect student decisions are: job security, financial gain, employment opportunities and needful work. Basic arguments that influence boys' decisions to study CS are: CS as an interesting subject of study and employment opportunities, while girls pay more attention to the argument that CS provides them with job security. Regarding the students' perception of their prospective future after studying CS, boys imagine themselves as Computer Scientists in a competitive and profitable career in the industry whereas girls emphasize permanency in their future jobs, without being overly concerned about the payment. The majority of boys and girls agreed that the profile of a Computer Scientist is suitable for both men and women. However, a respectable percentage of boys expressed the opinion that men are more suited to this kind of profession than women.

Regarding the specific factors that may influence student choice in following a CS profession, we can state that students at this age have probably not reached a level of self-consciousness so as to be able to address the factors that affect their choices explicitly. More research is needed to investigate in greater depth the role of the social environment on student choices of CS as a major.

**Acknowledgements:** Many thanks to Eleni Thermogianni for helping in the collection of the data used in this study and to Stephen Taylor at TES, Patras for proof reading and assisting with our English.

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Evrikleia Tsagala  
Dept. of Computer Engineering and Informatics  
University of Patras,  
26500, Rion Patras, Greece  
E-mail: [kampia21@otenet.gr](mailto:kampia21@otenet.gr),

Maria Kordaki  
Dept. of Computer Engineering and Informatics  
University of Patras and  
Research Academic Technology Institute  
26500, Rion Patras, Greece  
E-mail: [kordaki@cti.gr](mailto:kordaki@cti.gr)