Career choice in engineering students: its relationship with motivation, satisfaction and the development of professional plans

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Título: Elección de carrera en estudiantes de ingeniería: ¿cómo se relaciona con su motivación, su satisfacción y el desarrollo de sus proyectos profesionales?
Resumen: Elegir qué estudios realizar es una tarea relevante para el desarrollo personal, social y económico. Este trabajo analiza la relación entre la calidad de la elección de carrera en estudiantes del área científico-tecnológica con su motivación, satisfacción y ciertas características de sus proyectos profesionales. Para ello se tomó una muestra incidental de 89 estudiantes de las titulaciones de Arquitectura, Informática e Ingeniería de Montes de la Universidad Politécnica de Madrid (UPM).
Se presentan los datos descriptivos tras el análisis de las respuestas a un cuestionario adaptado *ad hoc*, y los resultados acerca de la dependencia entre las variables consideradas (analizados a través de la prueba Chi-Cuadrado) y de las diferencias en satisfacción en función del género y la titulación (pruebas no paramétricas).
Los contrastes confirman dependencia entre la motivación y la satisfacción que los estudiantes manifiestan, la titulación elegida con la temporalización y la estructuración de sus proyectos, así como entre el género y la temporalización de sus proyectos. No se encontraron diferencias significativas en las medidas de satisfacción (promedio de rangos).
Palabras clave: Elección profesional; motivación vocacional; desarrollo de carrera; proyectos profesionales; ingeniería; educación superior.

Abstract: Choosing a university degree is a relevant process for the personal, social and economic development. This study was designed to explore the students' choice for technical degrees. It is centered on the relationship between the quality of their choice and their motivation, satisfaction and development of professional plans.
The inquiry involved an incidental sample of 89 students from the Universidad Politécnica de Madrid (UPM) in Architecture, Computer Sciences and Forestry Engineering. After the analysis of the *ad hoc* adapted inventory, descriptive data and the results concerning dependence between the variables considered (analyzed with Pearson's chi-squared test) are presented. Non-parametric tests were used to asses differences on satisfaction by gender and degree studied. Results show dependence between the students' motivation and satisfaction, and the later and their professional plans' content. Gender and degree are also dependent with professional plans' temporality, as well as degree with their structure. No significant differences were found for the means in satisfaction.
Key words: Career choice; vocational motivation; career development; professional plans; engineering; higher education.

Introduction

Choice of vocation is an extremely important process not only for a person's own development but also for his/her social and economic development. At present, once the compulsory education stage has been completed, many young people are faced with the uncertainty of having to choose what they will study at university, while others have a vocation for a specific career. Most of the approaches of Vocational Psychology agree that this selection process involves the need to devote time to getting to know one's own vocational aptitudes and interests as well as compiling information on the different courses open to students, together with their requirements and demands (Valls, 1998).

It is beyond question that choosing which course of study to embark upon will exert an influence on an individual's professional development. Moreover, it is no easy task to undertake (de León, Rodríguez-Martínez, Ortega & González-Cifuentes, 2006), as adolescents usually still have a high degree of immaturity. Therefore, they do not always make the decision with the seriousness of thought required and often fail to avail themselves of the opportunities offered by the education and university system itself such as "Open Day at University", career guidance at school, etc. (Alexander et al., 2011). But everyone is interested in making decisions that have positive results, and choosing a career is a matching process, where the person matches his/her personal needs with the field that best fits them (Parsons, 1909; Anguelova, 2001).

The present circumstances of massive access to Higher Education and competitiveness in the labour market underline the importance of making a conscientious career choice that is consistent with and fits in with one's tastes, interests and aptitudes (Sánchez-García, 2001). With this, education costs can be reduced, as the academic success rate will increase and, at the same time, drop-out rates will be expected to decrease (for recent specific data in Spain see Rosselló, Olivares & Pujolras (2009)). Nevertheless, studies in the field of engineering show that these students do not really drop out, but change their course (González-Tirados, 1989).

Professional development may be understood as "the total constellation of psychological, sociological, educational, physical, economic, and chance factors that combine to influence the nature and significance of work in the total lifespan of any given individual" (National Center for Career and Technical Education, NCCTE, 1993). Its main purpose is seeking to increase satisfaction in the exercise of one's profession through the achievement of the highest professional competence.

The aim of this exploratory study is to look more deeply into aspects related to career choice within the context of engineering: to discover the nature of what motivates students to choose certain studies, the quality of such choices and students' level of satisfaction, as well as to describe how

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they relate to the nature of the plans they make to become part of the world of work.

Motivation is defined as an intention. As all constructs, it needs to be approached through indirect measurement basing it on individuals' self-perception. However, no-one questions its weight when explaining and predicting human conduct (Garrido, 2000). Motivation may be understood as the driving force that impulses a human being to achieve something specific that involves their total will-power; it responds to the reason behind their conduct (Palmero, 2005). Whatever the definition, what is certain is that motivation is intrinsically linked to the causes behind career failure, which justifies its being taken into account as the core of any research about career choice.

We may state that motivation is present at every stage of a decision-making process, since according to Mook (1987), it is the phenomenon that triggers the initiation, choice and persistence of certain actions in concrete circumstances. Given that career choice and professional development both involve constant decision-making processes it would seem logical for both to be linked to aspects of motivation.

As in every decision-making process, in the case of career choice, two basic components can be distinguished: some objective alternatives that can be opted for and have been specified, and other subjective criteria that are an individual's own reasons for being interested in this particular decision (Anguelova, 2001). These subjective reasons link directly to motivation, in which two basic types can be identified: intrinsic and extrinsic motivation (Deci, 1975). Recent studies in the educational psychology field recognize a greater complexity in the simple dichotomy between intrinsic and extrinsic motivation, differentiating sub-types in each of them (Núñez-del-Río, Fontana & Pascual, 2011). Nevertheless, this study will consider the classical approach.

The interest in the task or activity itself as well as its value regarding personal development are the characteristics of intrinsic motivation. In this case, students attribute their results to factors of their own, which are under their control (their hard work, their dedication), leading them to work out of interest in the subject, their eagerness to learn it and put it into practice. In other words, intrinsic motivation means choosing to do a task just for the satisfaction of doing it, under no obligation or pressure. On the other hand, extrinsic motivation moves a person to obtain a reward or avoid punishment, where factors such as chance, luck or other circumstances are used to explain outcomes. At the academic level extrinsic motivation occurs when the stimulus has no direct relationship to the subject studied. It is based on external factors such as social esteem, benefits or the avoidance of a sanction.

In both work and academic contexts, intrinsic motivation, in its wide acceptation, has frequently been linked to satisfaction as well as to achieving better results and productivity (Deci & Ryan, 1985). Along these lines, young people who embark upon the career choice process for reasons of intrinsic motivation would also be expected to be more satisfied with their chosen activity.

González-Maura (2009) compiles the results of various studies that confirm that a responsible career choice involves evaluating one's own tastes and skills as well as the possible alternatives, reflectively and individually. By doing so, a relationship between motivation and quality of career choice can be expected.

Being satisfied with the specific activities they undertake predisposes people to pursue their goals in their specific sphere of action with greater enthusiasm. Being aware of this, the entrepreneurial world promotes career planning for their employees, seeking to generate higher levels of satisfaction that will, in turn, lead to increased productivity and feelings of loyalty and commitment (Dolan, Valle-Cabrera, Jackson & Schuler, 2003). Career plans may be understood as emotional-cognitive developments of professional expectations and aims that guide the actions of the subject in their job performance. With this, it would be expected that young people who design better structured career plans that express detailed descriptions of the goals to be reached, specify a timescale and provide the means to achieve all this, would show higher levels of satisfaction with their career choice. They will also design career plans that are oriented towards developing the activity for which they are being trained and understand that this is not only part of their career development but also their personal development.

As to gender, the current literature states that male students in technical courses perceive they fit better into the world of engineering than female students. Women also lose more frequently interest in the STEM disciplines (Science, Technology, Engineering and Mathematics) over time (Matusovich, Streveler & Miller, 2010), and have a higher level of dissatisfaction with engineering studies (Anguelova, 2001).

In addition, Alexander et al. (2011) find that women appear to take the advice of others more (mainly their family) when choosing what to study. This is congruent with the data found by Anguelova (2001), according to which women let themselves be guided more by external factors when choosing a technical career, while men make a choice because of their intrinsic interest in the job. Additionally, women have to fight against a social stereotype bias that is widespread in diverse cultures and suggests they are not suitable for these kinds of careers and jobs (Trauth, Quesenberry & Huang, 2008; Zhang 2007).

As for career plans, there appears to be no gender difference, although men show more motivation and more ambitious plans than women (Anguelova, 2001).

Opting for a degree in Higher Education is nowadays fairly common among European youngsters, but not all of them make their choice in a thoughtful manner, after having taken into account personal and situational factors. The risk of increase in dropout rates being therefore higher. Counting with young well educated people is particularly important in a crisis situation like the one we are currently living as they

may contribute in a larger extent to economic growth being for example more prone to pursue entrepreneurial opportunities (Arenius & Minniti, 2005).

Taking these considerations into account, this study analyses diverse factors implicated in career choice in engineering students: type of motivation, quality of their choice, level of satisfaction and characteristics of their career plans.

Method

Participantes

89 students from the Universidad Politécnica de Madrid (UPM) volunteered to take part in the study. Of those 41% were studying Architecture, 38% Computer Sciences and 21% Forestry Engineering. The distribution by degree coincided with the course-age distribution since the Architecture students were mainly in their first year, those of Computing in their second year while the Forestry students were in their final year (sixth year). The sample was balanced as to gender with 55% men and 43% women (2% of the participants gave no information in this respect). The average age was 21.9 ($SD = 3.3$), with a minimum of 19 and a maximum of 29.

Instruments

The inventory, adapted *ad hoc* from a career motivation survey (González-Maura, personal communication), approaches different aspects connected with career choice and its links to vocation and profession (see Appendix 1). The tool comprised structured, semi-structured and open questions intended to explore the following dimensions:

1. *Type of motivation:* Intrinsic or extrinsic motivation for the chosen degree depending on whether it is based on interests, personal tastes or other factors inherent to personal development or on external factors such as, salary or job status. Within intrinsic motivation, it is distinguished whether it is high or low according to whether the interest shown in the course is intrinsically high (that is, if the student states he/she likes the course, these studies were his/her first choice and his/her preferred subjects during secondary education had any affinity to engineering) or only moderately so (if the foregoing was only partly true). On the other hand, it is explored whether or not extrinsic motivation is accompanied by an explicit rejection (for example, if the participant explicitly states he/she does not like the course).

2. *Satisfaction with the chosen degree*: The participants' level of satisfaction was evaluated using the Iadov technique (López & González-Maura, 2002; Villamide, Alvir, Alegre, García-Alonso & Nicodemus, 2006). This method is an indirect way of determining the level of satisfaction. Three closed questions that are related to one another are included in the inventory. Through what is called "Iadov's logic table" (see table 1), a numerical score may be assigned to each subject depending on his or her answers to these three questions. These scores are encoded on the following scale of satisfaction:
   1.- Very satisfied
   2.- Satisfied
   3.- Undefined
   4.- Dissatisfied
   5.- Very dissatisfied
   6.- Contradictory

Table 1. Iadov's logic table.

11. Do you like your future profession?	6. Would you like to be studying a different course from the one you're taking?								
	No			I don't know			Yes		
	17. If you would have the opportunity to choose your course, would you choose the same one?								
	Yes	I don't know	No	Yes	I don't know	No	Yes	I don't know	No
I like it a lot.	1	2	6	2	2	6	6	6	6
I like it more than I dislike it.	2	2	3	2	3	3	6	3	6
It is indifferent for me.	3	3	3	3	3	3	3	3	3
I dislike it more than I like it.	6	3	6	3	4	4	3	4	4
I don't like it.	6	6	6	6	4	4	6	4	5
I can't say.	2	3	6	3	3	3	6	3	4

As can be seen in table 1, a subject who responds in the inventory (see appendix 1) "no" to question number 6, "I like it a lot" to question number 11 and "yes" to question number 17, will be assigned a score of 1, meaning that he/she is very satisfied.

3. *Quality of Choice*: It is evaluated whether the student chose the course he/she is studying in a responsible or nor responsible way. Good quality (responsible) choices are based on the individual's own capacity perception and fruit of his/her personal decision. On the other hand, choices that are made as a result of external influences,

such as family or friends, or without proper recollection of information about the content or opportunities of the course, are considered not responsible.

4. *Career plans*: This dimension explores the professional plans expressed by students once their academic education would be complete. Three different characteristics of these plans were evaluated through different questions in the inventory: the plan's content (whether it includes specific professional goals), its timescale (regarding short- or long-term planning) and the plan's structure

(regarding specific means set out for the achievement of that goal).

5. *Self-assessment of one's performance as a student*: This dimension used open questions to explore whether the student had an adequate self-assessment, showing self-criticism and considering measures to overcome difficulties. However, the responses given by the participants were few and led to little enlightenment, and so, the dimension was eliminated from subsequent analyses.

Procedure

The subjects responded to a 26-item inventory which was given out during class on two of the degree courses and on-line for the third course. Participants' responses were grouped into the 5 previously defined dimensions (see instruments) by 4 trained coders who followed clear instructions on a template. For each dimension it was established whether the subject showed intrinsic motivation (high or low) or extrinsic (with or without explicit rejection), their level of satisfaction, if their choice had been responsible or not, and their career projects regarding content, timescale and structure. All the cases were then encoded on nominal scales except the level of satisfaction, was encoded on an or-

dinal scale. The self-assessment dimension as a student was eliminated as there were insufficient data from the respondents.

When the dimensions had been encoded on the relevant scales, the relationships between the aspects evaluated were calculated using Pearson's chi-square (χ^2). To evaluate the differences in the level of satisfaction according to gender and degree non-parametric tests (Mann Whitney U and Kruskal-Wallis H tests) were used.

Results

Table 2 shows the distribution by gender for each of the levels of the dimensions considered. In general, high rates of intrinsic motivation and responsible decisions can be observed regarding the chosen course. The levels of satisfaction expressed are lower, although over half the students claim to be satisfied or very satisfied. There is a marked percentage of subjects classified as "Undefined": 35%, the most numerous category. There are no individuals in the "Very dissatisfied" category. Regarding the career plan dimension, the results showed that their content is goal-directed, they were focused towards the long term but were lacking structure.

Table 2. Percentage distribution by gender and overall of the different aspects evaluated.

			Men	Women	Total
Motivation	HIM		70%	60%	66%
	LIM		12%	24%	17%
	EMWER		10%	11%	10%
	EMER		8%	5%	7%
Satisfaction	VS		31%	34%	33%
	S		24%	21%	22%
	UD		37%	32%	35%
	D		8%	13%	10%
	VD		-	-	-
Quality of Choice	R		67%	53%	61%
	NR		33%	47%	39%
Career Plan	Content	GDP	83%	75%	80%
		NGDP	17%	25%	20%
	Timescale	ST	6%	31%	17%
		LT	94%	69%	83%
	Structuring	SP	23%	22%	24%
		NSP	77%	78%	76%

Note: HIM= High intrinsic motivation; LIM= Low intrinsic motivation; EMWER = Extrinsic motivation without explicit rejection; EMER = Extrinsic motivation with explicit rejection; VS = Very satisfied; S = Satisfied; UD = Undefined; D = Dissatisfied; VD = Very dissatisfied; R = Responsible; NR = Not responsible; GDP = Goal-directed plan; NGDP = Not Goal-directed plan; ST = Short term; LT = Long term; SP = Structured plan; NSP = Non-structured plan

Regarding dependence between the different dimensions and motivation (table 3) significant results was found only for the relationship between motivation and the level of satisfaction of students ($\chi^2_{12}=27.2$, $p < .01$). A close examination of the frequency distributions indicates that intrinsic motivation is linked to higher levels of satisfaction but is un-

related to quality of choice and to the different aspects linked to the students' career plans.

In relation to the quality of choice no dependence was found between the dimensions taken into account (see table 4).

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Table 3. Observed and expected scores of the relationship between motivation and satisfaction, quality of choice and career plans. Values of χ^2 with their degrees of freedom.

Motivation		Satisfaction					Quality of Choice		Plans - Content		Plans - Timescale		Plans - Structure	
		VS	S	UD	D	VD	R	NR	GDP	NGDP	ST	LT	SP	NSP
HIM	Observed	23	15	18	3	-	38	21	49	9	9	50	15	43
	Expected	19.2	13.3	20.6	5.9	-	35.8	23.2	46.5	11.5	10.9	48.1	14.2	43.8
LIM	Observed	6	4	5	-	-	9	6	11	4	5	10	2	13
	Expected	4.9	3.4	5.2	1.5	-	9.1	5.9	12	3	2.8	12.2	3.7	11.3
EMWER	Observed	-	1	5	3	-	5	4	5	2	1	6	2	5
	Expected	2.9	2	3.2	0.9	-	5.5	3.5	5.6	1.4	1.3	5.7	1.7	5.3
EMER	Observed	-	-	3	3	-	2	4	4	2	1	5	2	4
	Expected	2	1.3	2.1	0.6	-	3.6	2.4	4.8	1.2	1.1	4.9	1.5	4.5
df		12					3		3		3		3	
χ^2		27.2**					2.3		2.1		2.7		1.4	

Note: HIM = High intrinsic motivation; LIM = Low intrinsic motivation; EMWER = Extrinsic motivation without explicit rejection; EMER = Extrinsic motivation with explicit rejection; VS = Very satisfied; S = Satisfied; UD = Undefined; D = Dissatisfied; VD = Very dissatisfied; R = Responsible; NR = Not responsible; GDP = Goal-directed plan; NGDP = Not Goal-directed plan; ST = Short term; LT = Long term; SP = Structured plan; NSP = Non-structured plan
** $p < .01$

Table 4. Observed and expected scores of the relationship between quality of choice and satisfaction and career plans. Values of χ^2 with their degrees of freedom.

Quality of Choice		Satisfaction					Plans - Content		Plans - Timescale		Plans - Structure	
		VS	S	UD	D	VD	GDP	NGDP	ST	LT	SP	NSP
R	Observed	21	14	17	2	-	46	7	7	46	12	41
	Expected	17.6	12.13	18.81	5.5	-	42.5	10.5	9.2	43.8	12.9	40.1
NR	Observed	8	6	14	7	-	23	10	8	25	9	24
	Expected	11.4	7.9	12.19	3.5	-	26.5	6.5	5.8	27.2	8.1	24.9
df		4					1		1		1	
χ^2		8.4					3.7		1.7		0.2	

Note: VS = Very satisfied; S = Satisfied; UD = Undefined; D = Dissatisfied; VD = Very dissatisfied; R = Responsible; NR = Not responsible; GDP = Goal-directed plan; NGDP = Not Goal-directed plan; ST = Short term; LT = Long term; SP = Structured plan; NSP = Non-structured plan

Data analysis to test the relationship between students' satisfaction and their technical course and career plan-related issues (content, timescale and structuring) are shown in table 5. Dependence between the level of satisfaction and plan content ($\chi^2_4=9.9$, $p < .05$) was found. The frequency distribution shows that higher levels of satisfaction are linked to goal-directed plans.

Table 5. Observed and expected scores of the relationship between satisfaction and career plans. Values of χ^2 with their degrees of freedom.

Satisfaction		Plans - Content		Plans - Timescale		Plans - Structure	
		GDP	NGDP	ST	LT	SP	NSP
VS	Observed	27	1	4	24	8	20
	Expected	22.5	5.5	4.9	23.1	6.8	21.2
S	Observed	17	3	2	18	1	19
	Expected	16	4	3.5	6.5	4.9	15.1
UD	Observed	19	10	7	22	7	22
	Expected	23.3	5.7	5.1	23.9	7.1	21.9
D	Observed	6	3	2	7	5	4
	Expected	7.2	1.8	1.6	7.4	2.2	6.8
VD	Observed	0	0	0	0	0	0
	Expected	0	0	0	0	0	0
df		4		4		4	
χ^2		9.9*		2.0		9.1	

Note: VS = Very satisfied; S = Satisfied; UD = Undefined; D = Dissatisfied; VD = Very dissatisfied; GDP = Goal-directed plan; NGDP = Not Goal-directed plan; ST = Short term; LT = Long term; SP = Structured plan; NSP = Non-structured plan
* $p < .05$

The findings related to gender (table 6) only revealed significant dependence for the career plans' timescale ($\chi^2_1=8.8$, $p < .01$). As can be seen in the data, the majority of men plan in the long term, while the amount of women planning in the short term is still quite high (nearly one third).

Table 6. Observed and expected scores of the relationship between gender and the different variables. Values of χ^2 with their degrees of freedom.

			Men		Women		df	χ^2
			Observed	Expected	Observed	Expected		
Motivation	HIM		34	32.1	23	24.9		
	LIM		6	8.4	9	6.6	3	2.1
	EMWER		5	5.1	4	3.9		
	EMER		4	3.4	2	2.6		
Satisfaction	VS		15	15.8	13	12.2		
	S		12	11.2	8	8.8		
	UD		18	16.9	12	13.1	4	0.9
	D		4	5.1	5	3.9		
	VD		-	-	-	-		
Quality of Choice	R		33	29.9	20	23.1	1	1.9
	NR		16	19.1	18	14.9		
Career Plan	Content	GDP	40	38.3	27	28.7	1	0.9
		NGDP	8	9.7	9	7.3		
	Timescale	ST	3	8	11	6	1	8.8 **
		LT	45	40	25	30		
	Structuring	SP	11	10.9	8	8.1	1	0.1
		NSP	37	37.1	28	27.9		

Note: HIM = High intrinsic motivation; LIM = Low intrinsic motivation; EMWER = Extrinsic motivation without explicit rejection; EMER = Extrinsic motivation with explicit rejection; VS = Very satisfied; S = Satisfied; UD = Undefined; D = Dissatisfied; VD =Very dissatisfied; R = Responsible; NR = Not responsible; GDP = Goal-directed plan; NGDP = Not Goal-directed plan; ST = Short term; LT = Long term; SP = Structured plan; NSP = Non-structured plan
** $p < .01$

Results for dependence between the different dimensions and the courses taken by engineering students are shown in table 7. Significant results are obtained for the dependence between the degree course and two of the dimensions for career plans: timescale (χ^2_2=23.2, $p < .001$) and structure (χ^2_2=12.3, $p < .01$). A close study of the data clearly shows that in the Architecture and Computer Sciences degrees, those surveyed have a greater tendency to plan in the long term. The trend is reversed on an examination of plan structuring where Computing students show a greater tendency to develop non-structured plans compared to the subjects of other qualifications.

Table 7. Observed and expected scores of the relationship between course and the different variables. Values of χ^2 with their degrees of freedom.

			Architecture		Computing		Forestry		df	χ^2
			Observed	Expected	Observed	Expected	Observed	Expected		
Motivation	HIM		28	23.9	19	22.5	12	12.6		
	LIM		4	6.1	6	5.8	5	3.2	6	8.4
	EMWER		3	3.6	6	3.4	-	1.9		
	EMER		1	2.4	3	2.3	2	1.3		
Satisfaction	VS		15	11.7	9	11.1	5	6.2		
	S		6	8.1	10	7.7	4	4.3		
	UD		9	12.6	13	11.8	9	6.6	8	7.4
	D		6	3.6	2	3.4	1	1.9		
	VD		-	-	-	-	-	-		
Quality of Choice	R		23	21.8	19	20.6	12	11.5	2	0.5
	NR		13	14.2	15	13.4	7	7.5		
Career Plan	Content	GDP	32	28.9	25	24.9	12	15.2	2	5.2
		NGDP	4	7.1	6	6.1	7	3.8		
	Timescale	ST	5	6.3	-	5.4	10	3.3	2	23.2***
		LT	31	29.7	31	25.6	9	15.7		
	Structuring	SP	12	8.8	1	7.6	8	4.6	2	12.3**
		NSP	24	27.2	30	23.4	11	14.4		

Note: HIM = High intrinsic motivation; LIM = Low intrinsic motivation; EMWER = Extrinsic motivation without explicit rejection; EMER = Extrinsic motivation with explicit rejection; VS = Very satisfied; S = Satisfied; UD = Undefined; D = Dissatisfied; VD =Very dissatisfied; R = Responsible; NR = Not responsible; GDP = Goal-directed plan; NGDP = Not Goal-directed plan t; ST = Short term; LT = Long term; SP = Structured plan; NSP = Non-structured plan
** $p < .01$; *** $p < .001$

Finally, we present results concerning the study of the differences in the students' level of satisfaction. For this, the level of satisfaction was numerically encoded. Then, non-parametric tests were carried out both for gender and degree.

No significant differences were found for any of the factors (see tables 8 and 9), so the statistical equality in the average ranks of satisfaction expressed by students on the different courses, either men or women, can be confirmed.

Table 8. Descriptors for the level of satisfaction according to gender and course.

Gender	University Course	Mean	Standard deviation	N
Male	Architecture	2.15	1.214	13
	Computing	2.30	.912	27
	Forestry	2,.11	.928	9
	Total	2,22	.985	49
Female	Architecture	2.14	1.167	22
	Computing	2.00	1.000	7
	Forestry	2.67	.866	9
	Total	2.24	1.076	38
Total	Architecture	2.14	1.167	35
	Computing	2.24	.923	34
	Forestry	2.39	.916	18
	Total	2.23	1.020	87

Table 9. Non-parametric test results (gender and course) over the VD numerical satisfaction.

VI		Mean rank	Statisctic	df	Sig.
Gender	Male	43.97	929.50[a]	1	.989
	Female	44.04			
University Course	Architecture	43.25	0.392[b]	2	.822
	Computer Sciences	45.44			
	Forestry Engineering	47.53			

a. Mann-Whitney *U* test
b. Kruskal-Wallis *H* test (Chi-square equivalent)

Discussion and Conclusions

The primordial aim of this study was to analyse in depth the different dimensions involved in the choice of vocation and the professional development of students on various technology degree courses. In accordance with the results obtained, we can state that there is a relationship between the type of motivation shown by students towards their degree course and their level of satisfaction with it. As was expected and shown by previous research (Deci & Ryan, 1985), these data confirm that high levels of intrinsic motivation lead to a higher level of satisfaction. This is beneficial for academic as well as job performance. It is therefore extremely important to emphasise the need for young people to make decisions based on their intrinsic interest for the subject when choosing a specific career or job (Rodríguez-Moreno, 2007; Sánchez-García, 2001), as the findings support this theory.

Moreover, the results obtained indicate that even when students make a responsible career choice (based on information about the course or self-capacity and not on others' opinion and advice), they do not always show high levels of motivation or explicit interest for it. González-Maura (2003) points out that, due to deficient educational and vocational guidance, one relevant weakness of university students is their lack of professional self-determination. This is charac-

terised by a lack of reflection and solution-seeking when faced with possible conflicts during the academic-professional development process. On the other hand, the right level of professional self-determination contributes flexibility of thought as well as career motivation in the long term, which will help individuals to face up to any job problems that might arise. Therefore, at the start of university life the determining factor would not be so much that the choice of study had been made because of high levels of motivation, but that it had been made responsibly, that is after a profound personal reflection and self-assessment of one's abilities. If such a responsible and personal decision is made, even individuals who show no prior high intrinsic motivation will be able to redirect their motivation and develop a deep interest in the subject or work they will do in the future (González-Maura, 2003).

Vocational guidance is a process that must be lifelong and not just carried out before choosing higher education courses (Sánchez-García, 2001; Sebastián, Rodríguez-Moreno & Sánchez-García, 2003; Valls, 1998). Planning structured career plans directed towards specific goals is especially important if we look at how this relates positively to high levels of satisfaction with the chosen course. Therefore, we must insist on the need to develop adequate career guidance procedures to help young people plan their academic and professional development.

The existence of gender differences was also considered. According to the literature reviewed, women tend to show less interest in technological or scientific studies as they progress on their course (Matusovich et al., 2010). Some studies have clearly shown that the choice of engineering degrees by women is made in a less responsible way than by men. It would seem that women are more vulnerable to the influence of other people, particularly their family, and at the same time show higher levels of dissatisfaction (Anguelova, 2001). However, this study's results revalidate previous findings in UPM (González-Tirados, 2004), where no dependence between gender and motivation, the level of satisfaction and the quality of choice was detected. In addition, the non-parametric tests carried out for the levels of satisfaction, revealed no significant differences regarding the gender of the participants. Significance was only found regarding the timescale of the career projects, where men showed a greater tendency than women to plan in the long term. This finding could be congruent with Anguelova's results (2001), where men showed more ambitious plans than women. The fact that men show greater ambition could justify 94% of them making long term plans. Whatever the case, this question may be of interest and will require further in-depth research.

The type of variables that were intended to be measured could be pointed out as a possible limitation to the study as they are non-observable constructs. This circumstance makes it difficult to establish methods that enable motivation or quality of course choice to be measured. That is why we opted for an inventory that combines closed and open questions in an effort to obtain as much information as pos-

sible. Notwithstanding, we are aware of the difficulties involved in interpreting the studied variables. It would be interesting to deepen its study, aiming to verify the inventory's soundness with a larger and more heterogenic sample. In this sense, more subjects in the same courses (Architecture, Computer Sciences and Forestry Engineering), as well as students from other courses could be added to the sample, balancing the number of students in their first and last year at university. This would enable the results to be compared to those of other years of the same course and to the results of different degrees.

It would also be of interest to make a follow-up research looking at graduates in their jobs and ascertain their levels of satisfaction in order to compare those individuals who pursued careers mostly on intrinsic motivation with those who did it based mostly on extrinsic motivation.

In conclusion we can state that intrinsic motivation for a career is a relevant factor for later satisfaction with one's academic and professional development. However, it is essential to strengthen vocational guidance in order to foster responsible choices in those who aspire to a university education. It is also essential to design concrete plans for their future with a view to training young professionals with large degrees of autonomy, motivation, guidance and structuring, all of which will bear fruit in the form of increased productivity and satisfaction in the work context.

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Appendix 1. Inventory on Career Motivation

Degree course....................................... Year................. Age................. Sex.........................

CAREER MOTIVATION

Instructions: *We would like to know your opinion on some aspects related to your degree course. Your responses to the questions you will find below will be very valuable for improving university students' education, so we would ask you to give honest answers. There are no right or wrong answers, what we are interested in is your opinion. You do not need to write your name.*

1. **Mark with a cross any situation connected with the course you are on that corresponds to your personal experience.**
You may mark as many options as you wish.

_____ I like the course.
_____ I chose it because I understood its social relevance
_____ I chose it because it is similar to the career I really like.
_____ I don't like the course.
_____ I didn't have the chance to do the course I really wanted to.
_____ I chose this course because I felt pressured by my family.
_____ I didn't want to be without a university degree
_____ Other(s) State which ....

2. **Choosing a course was for you:**

   __ Very difficult   __ Difficult   __ Neither easy nor difficult   __ Easy   __ Very easy

Explain why

3. **Indicate the order of importance (from 1 to 4) of the factors that influenced your decision to study this course:**

_____ Academic preferences

_____ Family influence

_____ Future job salary

_____ Vocation

_____ Other (indicate):

4. **Do you consider that any particular person influenced your career preferences?**

   __ Yes   __ No   __ I don't know

If the answer is yes, mark with a cross to show who:

Teacher__ Family__ Friend(s) __ Others (indicate)…………………………………..

5. **Did you come up against obstacles when choosing your course? Which ones?**

6. Would you like to be studying a different course from the one you're taking?

__ Yes   __ No   __ I don't know

Why?

7. When you were in high school, what subjects did you like most?

1st place ………………………………………………………………………………
2nd place………………………………………………………………………………
3rd place ………………………………………………………………………………

8. And those you liked least during that time?

1st place ………………………………………………………………………………
2nd place………………………………………………………………………………
3rd place ………………………………………………………………………………

9. When you were a child, do you remember the trades or jobs that you wanted to have ? Mark with a cross as many answers as you wish:

Doctor__ Firefighter__ Teacher__ Police Officer__ Soldier__ Builder__ Astronaut__

Archaeologist__ Pilot__ Artist__ Other (indicate) …………………………………..

10. On completing high school, what were the university degrees for which you showed an inclination or preference (regardless of the possibilities you had of studying them)? Indicate in order of preference:

1st place ………………………………………………………………………………
2nd place………………………………………………………………………………
3rd place ………………………………………………………………………………

11. Do you like your future profession?

__ I like it a lot.
__ I like it more than I dislike it.
__ It is indifferent for me.
__ I dislike it more than I like it.
__ I don't like it
__ I can't say

12. What do you like most about your future profession?

Versatility__ Income__ High demand__ Continuous training__ Tasks to be undertaken__

Other (indicate) …………………………………………………………………………..

13. What do you like least about your future profession?

Timetable__ Low demand__ Competitiveness__ High specialisation__

Other (indicate) …………………………………………………………………………..

14. What career plans do you have when you complete this degree?

15. What are you doing at present to achieve those plans?

16. After graduating, do you intend to remain in your profession?

__ Always   __ Some time   __ Never

Give reasons for your answer:

17. If you would have the opportunity to choose your course, would you choose the same one?

 __ Yes   __ No   __ I don't know

Give reasons for your answer:

18. How would you evaluate your performance as a university student?

 __ Excellent   __ Good __ Average   __ Bad

Why?

19. The average mark of your academic record is:

 __ Pass   __ Very good__ Excellent

20. You attend class:

 __ Always   __Frequently   __ Sometimes   __ Never

21.   Below is a list of reasons for not attending class. Put a cross against the reasons for which you wouldn't attend class and leave the rest blank.
Bear in mind that you should only mark those for which you wouldn't attend class and not those that are actually true; for example, it may be that class attendance does not count as part of the final evaluation, but you should only mark it when you do not attend class for that reason.

I WOULD NOT ATTEND CLASS BECAUSE:

__ Attending does not help me understand the subject
__ Attendance does not count for the final mark
__ I prefer spending the time studying the notes people lend me
__ I can see no connection between the content taught and my training expectations.
__ I worry I might be asked questions in class
__ The teacher just dictates notes and doesn't bother whether we understand them.
__ The teacher makes no connection between subject content and its possible applications
__ The explanations are beyond my level of knowledge and comprehension
__ The assessment does not correspond to what is taught in class
__ I prefer to go to a private academy where they prepare you for the exam
__ The teacher is not motivating
__ The participation of students who follow the class is not valued
__ Classes do not train you for your job
__ Classes are very theoretical and not very practical

22. Write three reasons in order of importance that you think are necessary for deciding to attend class on a regular basis:

1. …………………………………………………………………………………
2. …………………………………………………………………………………
3. …………………………………………………………………………………

23. What features of your personality do you think fit in with your profession?

Perseverance__ Patience__ Diligence__ Empathy__ Objectivity__

Leadership__ Talkativeness__ Responsibility__ Other (indicate) ……………………..

24. Your motivation for your chosen profession during your university studies:

__ Has increased   __ Has diminished __ Is the same

Why?

25. During your university studies has there been any teacher whose attitude has had a positive influence on you?

__ Yes   __ No

If the answer is yes, could you briefly describe your experience?

26. Do you think the course prepares you for your working life?

__Yes   __ No

Why?

Other comments or suggestions: