

# Entrepreneurship Intentions of University Students: Exploring Differences between Management and Engineering Students

Filipa Vieira, Cristina Rodrigues and Ana Nunes

University of Minho, Guimarães, Portugal

[filipadv@dps.uminho.pt](mailto:filipadv@dps.uminho.pt)

[crodrigues@dps.uminho.pt](mailto:crodrigues@dps.uminho.pt)

[anaaaisa94@gmail.com](mailto:anaaaisa94@gmail.com)

**Abstract:** In the current economic context of great complexity, entrepreneurship is perceived as an alternative to create employment and reduce uncertainty, and allows the transformation of an innovative idea into a company. Entrepreneurship is a concept with many peculiarities. It is not an exact science to be implanted, but a way of thinking to be developed. It emphasizes opportunities rather than threats and obstacles, and its ability to identify opportunities requires first and foremost the study of entrepreneurial intentions of individuals (Krueger et al., 2000). What determines individual's decision to create their own business? Variables such as personal characteristics, family influence, social background, self-efficacy and others have been pointed out, but the understanding of the different motivations for someone to undertake has revealed a dynamic and complex area of study. According to Theory of Planned Behaviour (Ajzen, 1991), individuals engage in an activity (such as starting a business) as a deliberate action which is reflected on their intention to this behaviour. The aim of the investigation is to measure and compare the entrepreneurial intentions of engineering and management students. The paper presents the results of a survey, named EMPREENDE 2017, which included 436 Portuguese students from the University of Minho. The sample focused on students from the 1st to the 3rd year of different courses at the Engineering School and the Management School at the university, divided into engineering students (49.08%) and management students (50.92%). The study does not identify differences in the entrepreneurial experience of parents but identifies differences in attitude, subjective norms, perceived control, and entrepreneurial intention of the two groups of students.

**Keywords:** Entrepreneurial intentions; university students; engineering and management students; University of Minho, Portugal; survey

---

## 1. Introduction

Entrepreneurship is seen as a mechanism to promote employment in a country and, as a result, to accelerate the development of the respective economy (Bryson et al, 2017; Baptista, Escára and Madruga, 2008; Van Stel, Carree and Thurik, 2005). This is why members of the Organization for Economic Co-operation and Development (OECD) give priority to entrepreneurship as an alternative to counteract the effects of the economic crisis that is still felt in several countries (OECD, 2009). By recognizing new and innovative business opportunities and taking risks, it is possible to reverse the current situation by increasing competitiveness and adjusting markets (Rahman, Ahmad and Taghizadeh, 2016, Hisrich, Peters and Shepherd, 2014, Oosterbeek, Van Praag and Ijsselstein, 2010, Sarkar, 2010).

One of the recommendations to increase entrepreneurship is for universities to take an active formative role. Universities must prepare their students for entrepreneurship by taking a more active position in transmitting technical and theoretical knowledge and providing them with the indispensable tools to start and maintain their own business (Duval-Couetil, Shartrand and Reed, 2016; Souitaris, Zerbinati and Al-Laham, 2007).

Starting from the premise that technical and academic knowledge are important for the creation of an entrepreneur, engineering students have more technological and industrial knowledge, and may be perceived as having greater ability to detect new business opportunities. In turn, students of socio-economic sciences, given their training, are perceived as having greater affinity with issues related to the economic viability of a business. Although they do not all have the same competencies, these two groups of students are considered the most capable individuals to create successful companies that promote economic growth (Maresch et al, 2016). Both have the necessary knowledge to undertake, yet is their predisposition and entrepreneurial intent the same?

The paper is structured as follows. Section 2 defines an entrepreneur. Section 3 presents the conceptual background of entrepreneurship intention. In the Section 4 is presented the results of a survey to engineering

and management students to measure and compare their entrepreneurial intentions. Finally, in Section 5, are presented the main conclusions.

## **2. What defines an entrepreneur**

Like the concept of entrepreneurship, also the concept of entrepreneur has been the subject of discussion by some authors. Between the nineteenth century and the twentieth century the entrepreneur is seen as an individual capable of forming and managing a company in the face of uncertainty, which accounts for expenses and manages to make a profit by the end of the year. Also the ability to "invent" is added to the idea of entrepreneur, that is, the entrepreneur is someone who can innovate through invention or the reinvention of a product or a process (Hisrich, Peters and Shepherd, 2014). Schumpeter, in 1951, was the first author to defend this image of the entrepreneur as an innovator, who has the skills to create new services, products and technologies. This is seen as an individual who has a set of characteristics and skills that enable him to manage, organize and deal with his own business risk (Sarkar, 2010).

The GEM declares the entrepreneur as an individual who is entrepreneurially active in implementing a business or managing an existing one (Reynolds et al, 2005). According to this report the entrepreneur is defined "as those who capture good opportunities to start a business, as well as those who believe they have the required skills, are the potential entrepreneurs of society." (Global Entrepreneurship Research Association, 2017, p.19).

Currently, an entrepreneur is considered to be the one who has technical knowledge and experience, as well as a set of genetic and psychological characteristics that contribute to his predisposition to undertake (Belás and Ključnikov, 2016; Honjo, 2015; Raijman, 2001). The family and the previous experiences of the individual can influence his decision to start a business. For instance, the contact with the entrepreneurial example of the parents can result in a greater appreciation of the autonomy and independence of a business of its own (Laspita et al, 2012; Wyrwich, 2015). One of the most salient psychological characteristics is leadership, that is, the individual's ability to lead the business, the organization, and the individuals around him. Entrepreneurs, apart from being ambitious, are also passionate about what they are developing and trusting in themselves and their abilities. Another characteristic trait of the entrepreneur, equally important, is constant learning from the analysis of other businesses, both the successful and the failed. This attribute promotes two other features, namely, problem-solving and decision-making (Belas and Ključnikov, 2016; Hisrich, Peters and Shepherd, 2014).

For this there are two approaches to entrepreneurship programs. De Jorge-Moreno, Laborda Castillo and Sanz Triguero (2012), Duval-Couetil, Shartrand and Reed (2016), Liñán (2004) and Souitaris, Zerbini and Al-Laham (2007) advocate an approach that consists in alerting students to the importance and impact of entrepreneurship in the country's economy, personal life and how the creation of one's own business can become a professional career. The other approach has a more practical approach, such as providing all the necessary tools and promoting academic contact with work reality, for example through networking or mentors in some successful activities or potential funders.

## **3. Entrepreneurship: from intention to action**

Many researchers have studied entrepreneurship including the identification and study of explanatory factors for entrepreneurial behaviour. In the literature of psychology, it has been demonstrated the explanatory power of intention as an important predictor of behaviour. Ajzen (1991) developed the Theory of Planned Behaviour, which explains one's intention to behaviour as the result of three antecedents: 1) the positive or negative attitude with which he faces this behaviour, 2) the opinion that others have of this same behaviour (subjective norms) and 3) the perceived control of the same.

Entrepreneurial intention can be seen as a precise predictor of planned behaviour towards starting a new business. The Theory of Planned Behaviour developed by Ajzen (1991), when applied to the entrepreneurial behaviour (to create the own business), can also explain the entrepreneurial intention of the individuals. In the specific case of entrepreneurship, the attitude towards the behaviour is the reflection of the degree of familiarity that the individual has with entrepreneurship, i.e., whether she/he has a positive or negative attitude towards entrepreneurship, and whether or not she/he can identify benefits in entrepreneurship. The subjective norm translates whether individuals feel influenced by others in the sense of becoming

entrepreneurs, namely the impact that the opinion of others exerts on decision making, especially the opinion of those who are close to them or who are seen as a following example. Finally, the perceived behaviour control measures the ease of acquisition of a particular behaviour, in this specific case the entrepreneurial behaviour (Ajzen, 1991; Carr and Sequeira, 2007; Fretschner, 2014; Küttim et al, 2014; Lee et al, 2011; Liñán, Rodríguez-Cohard and Guzmán, 2011; Liñán and Fayolle, 2015; Maes, Leroy and Sels, 2014; Obschonka, Silbereisen and Schmitt-Rodermund, 2010; Peterman and Kennedy, 2003; Souitaris, Zerbini and Al-Laham, 2007; Zhang, Duysters and Cloudt, 2014).

Krueger, Reilly and Carsrud (2000) and Shapero and Sokol (1982) suggest that the entrepreneurial intention of an individual is also influenced by two other components, which intertwine with subjective norm and personal attitude: the perceived desire and perceived capacity. The first one reflects how attractive the individual feels that behaviour is (in this case entrepreneurial behaviour), and the second refers to the capacity recognized by the individual to undertake. Perceived capacity is also related to the level of self-confidence of the individual, which consequently influences the perception of perceived control.

The family has an influence on the development of entrepreneurial intentions of an individual. Laspita et al (2012) and Bhandari (2012) argue that the exposition to a family business can propensity offspring's entrepreneurial intentions by increasing their perceptions that self-employment is a meaningful career option and it is possible to obtain highest entrepreneurial rents.

#### **4. Data collection and analysis**

This paper presents the preliminary results from a survey designed to measure and compare the entrepreneurial intentions of engineering and management students. Engineering students have a vast technological and industrial background, which eases the recognition of new business opportunities, and management students are familiar with the contents and tools of the economic viability of the business.

Although they have different skills, they are considered as the set of individuals most suitable to create successful companies that promote economic growth (Maresch et al, 2016).

The survey, named by EMPREENDE 2017, was applied to students of engineering and management courses from University of Minho who were approached in their classes and asked to participate in the research. Our sample has a total of 436 respondents, divided into engineering students (49.08%) or management students (50.92%). The gender distribution reflects the female domain among engineering and management students (65.37% females and 34.63% males). From the three analysed years it was verified that 39.68% of the respondents are first year students, followed by 35.32% of the third year and 25.00% of the second year (see Table 1).

**Table 1:** Respondents' profile

	Characteristic	Percentage (%)	Total
Gender	Male	34.63	151
	Female	65.37	285
	Total	100.00	436
School	Engineering	49.08	214
	Management	50.92	222
	Total	100.00	436
Academic year	1º	39.68	173
	2º	25.00	109
	3º	35.32	154
	Total	100.00	436

Age ranges from 18 to 37 years (amplitude 19), with a mean of 19.96 years and a standard deviation of 2.432 years (with mode and median equal to 20 years).

##### **4.1 Entrepreneurial behaviour of students' parents**

The study begins by asking the respondents about the entrepreneurial behaviour of their parents: "Have you grown up in an entrepreneurial family? Do you have a father and / or a mother with their own business?" (Adapted from Laspita et al (2012)). Table 2 presents answers: 58.49% of respondents admit that their parents were never entrepreneurs against 41.51% who reported that parents have or have had a business (32.80% of

respondents indicate that the business is still active, 5.28% that has been over for more than five years and 3.44% that the business has ended but still was active until 5 years ago), which represents a significant percentage of entrepreneurs parents.

**Table 2:** Entrepreneurial behaviour of students' parents

<i>"Have you grown up in an entrepreneurial family? Do you have a father and/or mother with their own business?"</i>	Total		Engineering School		Management School	
	n	%	N	%	n	%
a. Yes, their business is still active	143	32.80%	65	30.37%	78	35.14%
b. Yes, but it still worked at least until 5 years ago	15	3.44%	6	2.80%	9	4.05%
c. Yes, but their business ended more than 5 years ago.	23	5.28%	12	5.61%	11	4.95%
d. No, my parents were never entrepreneurs	255	58.49%	131	61.21%	124	55.86%
<b>Total</b>	<b>436</b>	<b>100.00%</b>	<b>214</b>	<b>100.00%</b>	<b>222</b>	<b>100.00%</b>

In Table 2, the analysis by also can be seen that 61.21% of engineering students choose the option "No, my parents were never entrepreneurs" against 55.86% of management students with no entrepreneur parents.

The percentage of students whose parents have a business still active is 30.37% for engineering students and 35.14% for management students, respectively.

A chi square test was conducted to determine whether there was an association between school and entrepreneurial behaviour of students' parents. A non-significant relationship was present ( $\chi^2 = 1.871$  (3),  $p=0.600$ ).

#### 4.2 Entrepreneurship: attitude, subjective norms and perceived behaviour control

The Theory of Planned Behaviour (Ajzen, 1991) defines that the intention of a given behaviour is based on attitude, subjective norms and perceived behaviour control. In order to explore the differences between the two groups of students under study (engineering students vs management students), the questionnaire included questions to measure their attitude towards entrepreneurship, their perception of the subjective norms for entrepreneurship and their perceived behaviour control in entrepreneurship. Since scales were adapted from previous studies (see Table 3), to refine the scale adaptation process to Portuguese, a back translation and back translation review were implemented (the scales were translated into Portuguese and then translated back into the original English and the versions were compared with the original).

**Table 3:** Measurements

Scale	Items	Authors
Attitude towards entrepreneurship	5	Liñán, Rodríguez-Cohard and Guzmán (2011), Matlay et al (2014), Solesvik (2013)
Subjective norms for entrepreneurship	8	Carr and Sequeira (2007), Solesvik (2013)
Perceived behaviour control	5	Solesvik (2013), Souitaris, Zerbini and Al-Laham (2007), Zhang, Duysters and Cloedt (2014)

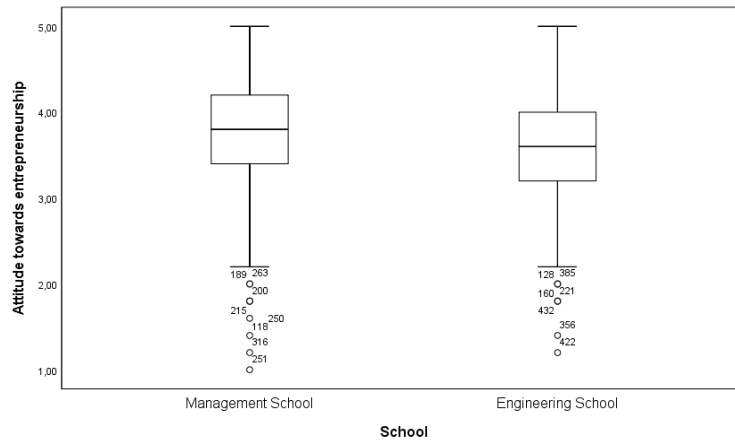
#### 4.3 Attitude towards entrepreneurship

The items of attitude towards entrepreneurship were measured on a five-point Likert scale and included the following statements: 1. "Being an entrepreneur implies more advantages than disadvantages for me", 2. "A career as an entrepreneur is attractive to me", 3. "If I had the opportunity and the necessary resources, I would like to open my own company", 4. "Being an entrepreneur generates great satisfaction for me", 5.

"Among the various options in the job market, I prefer to be an entrepreneur". The reliability analysis of scales was assessed by calculating Cronbach's alpha and principal component analysis (PCA). The Cronbach's alpha of the attitude scale was 0.871 and the PCA found that all five statements loaded on a single component.

The score of the variable was obtained by calculating the mean of the answers obtained in the scale items.

Figure 1 shows the attitude towards the entrepreneurship of the students of the management school and the engineering school. Both distributions present outliers answers, that is, respondents who register lower values in the attitude towards entrepreneurship (as their answers were considered valid, they were chosen for their maintenance). Regarding the distribution of the answers, engineering students tend to be lower than their management colleagues.



**Figure 1:** Students’ attitude towards entrepreneurship by school

The Kolmogorov-Smirnov test concluded that the data from the two samples did not follow a normal distribution ( $p=0.042$ ). Thereafter a nonparametric Mann-Whitney test was used to test significant differences between students’ schools in attitude towards entrepreneurship confirmed that there was a significant difference in attitude between management and engineering students (Mann-Whitney  $U=20477.5$ ,  $p=0.012$ ).

#### 4.4 Subjective norm for entrepreneurship

The items of subjective norms were measured on a 5-level semantic differential scale (1- "Extremely negative" to 5- "Extremely positive") and included the following statements: 1. “My parents consider \_\_\_\_\_ that I create my own business”, 2. “My boyfriend/girlfriend considers \_\_\_\_\_ that I create my own business”, 3. “My brother(s)/sister(s) consider \_\_\_\_\_ that I create my own business”, 4. “In general, my relatives consider \_\_\_\_\_ that I create my own business”, 5. “My neighbours consider \_\_\_\_\_ that I create my own business”, 6.

“My colleagues consider \_\_\_\_\_ that I create my own business”, 7. “In general, my acquaintances consider \_\_\_\_\_ that I create my own business”, 8. “My closest friends consider \_\_\_\_\_ that I create my own business”.

The Cronbach’s alpha of the subjective norms scale was 0.876 and the PCA found that all eight statements loaded on a single component.

The score of the variable was obtained by calculating the mean of the answers obtained in the scale items. Figure 2 shows the subjective norm for entrepreneurship by students’ school. Both distributions present outliers answers. In the case of the school of management, the outlier is a student with lower perceived subjective norm for entrepreneurship compared to those of his schoolmates. In the case of the engineering school, there are three respondents who register higher values in the subjective norm for entrepreneurship. In both situations the answers were considered valid and they were chosen for their maintenance. Regarding the distribution of responses, management students present a distribution of responses with left asymmetry. The distribution of responses from engineering students is more symmetrical, but has a lower median than that of management students.

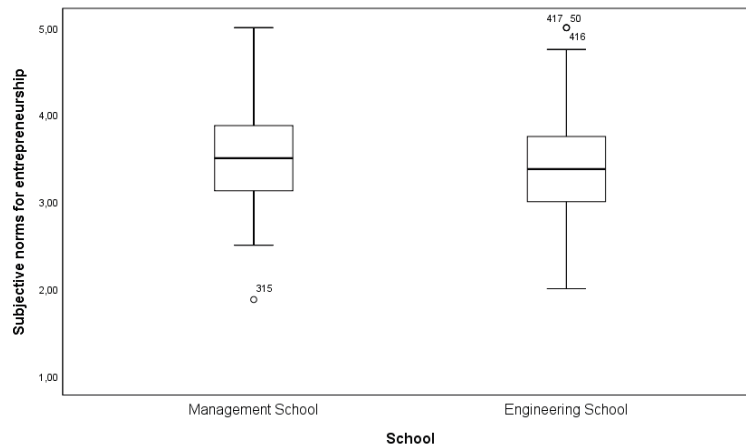


Figure 2: Students' subjective norms for entrepreneurship by school

To explore the existence of differences of the subjective norm for entrepreneurship between the two schools, as the data did not follow a normal distribution (Kolmogorov-Smirnov test with  $p=0.017$ ) the non-parametric Mann-Whitney test was performed. The test confirmed that there was a significant difference in attitude between management and engineering students (Mann-Whitney  $U=20861.5$ ,  $p=0.026$ ).

#### 4.5 Perceived behaviour control in entrepreneurship

The items of perceived behaviour control were measured on a 7-level semantic differential scale and included the following statements: 1 "For me, being a self-employed would be... (from 1- "Very difficult" to 7- "Very Easy")", 2 "If I wanted to, I could easily pursue a career as a self-employed (from 1- "I totally disagree" to 7- "I totally agree")", 3 "As a self-employed person, the control I would have over the situation would be (from 1- "No control" to 7- "Full control")", 4 "The number of events outside my control that could prevent me from being self-employed are (from 1- "Many" to 7- "Few")", 5 "If I were a self-employed person, my chances of success would be (from 1- "Unlikely" to 7- "Very likely")". The Cronbach's alpha of the perceived behaviour control scale was 0.721 and the PCA found that all five statements loaded on a single component.

The score of the variable was obtained by calculating the mean of the answers obtained in the scale items.

Figure 3 shows the perceived behaviour control in entrepreneurship by students' school. Both distributions present outliers answers, with lower perceived behaviour control in entrepreneurship compared to those of his schoolmates. Regarding the distribution of responses, management students present a more symmetric distribution of responses. The distribution of responses from engineering students has a left asymmetry with a lower median than that of management students.

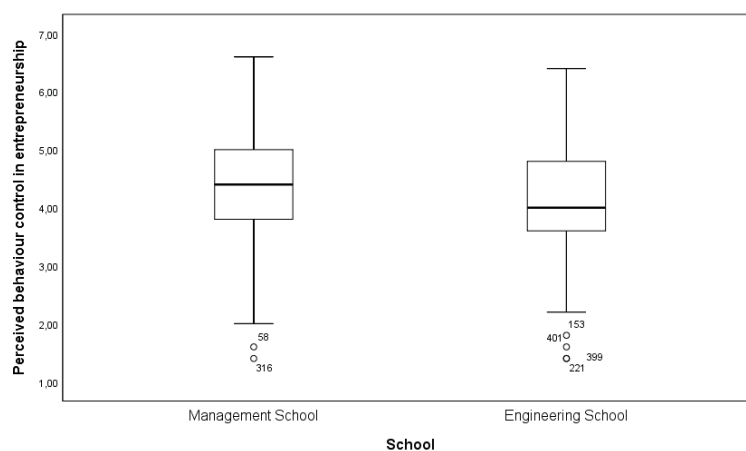


Figure 3: Students' perceived behaviour control in entrepreneurship by school.

As the data did not follow a normal distribution (Kolmogorov-Smirnov test with  $p=0.003$ ), a non-parametric Mann-Whitney test was performed to explore the existence of differences of the perceived behaviour control

in entrepreneurship. The test confirmed that there was a significant difference in perceived behaviour control in entrepreneurship between management and engineering students (Mann-Whitney U=19937.5, p=0.005).

Thus, at the level of attitude towards entrepreneurship, subjective norms for entrepreneurship and perceived behaviour control in entrepreneurship were found statistically significant differences between the two schools.

Table 4 summarizes the results.

**Table 4:** Attitude, subjective norms and perceived behaviour control vs. schools

Scale	Management School	Engineering School	Mann-Whitney
Attitude towards entrepreneurship	3.69	3.53	**
Subjective norms for entrepreneurship	3.55	3.45	**
Perceived behaviour control	4.41	4.17	*

(\* p-value<1%; \*\*p-value<5% e \*\*\*)

#### 4.6 Entrepreneurship intention

In order to understand the entrepreneurship intention, as a career option, the students were asked to indicate their response to three questions (using a semantic scale of 3 items with 7 levels of response adapted from Souitaris, Zerbinati and Al-Laham (2007)):

1. "If you had to choose between your own business and being hired by someone, what would you prefer?" (From -3- "I would rather be hired by someone" to +3- "I would rather have my own business");
2. "How likely are you to be self-employed?" (From -3- "Unlikely" to +3- "Very likely");
3. "How likely are you to work in an organization?" (From -3- "Unlikely" to +3- "Very likely").

In the first question ("If you had to choose between your own business and being hired by someone, what would you prefer?") students indicate prefer have rather their own business with 62.16% of positive responses (the sum of the answers + 1, + 2 and +3). The management students present a bigger preference for their own business (65.77% positive responses against 58.41% for the engineering students).

In the second question ("How likely are you to be self-employed?") only 51.15% of the respondents assume they are likely to have their own business (positive responses). When analysing the students' school, it is interesting to compare the 57.66% of positive responses from the management students and the 44.39% of positive responses from the engineering students. It suggests a lower entrepreneur intention by the engineering students.

In the last question ("How likely are you to work in an organization?") respondent students assume as moderate to high the probability to work in an organization (81.80% of positive responses). When comparing schools, there are no major differences (81.69% of positive responses in engineering students and 81.90% in management students). Given the answers obtained in question 2, we expected lower values, at least on the part of management students. One could try to find a justification such as the age of the students (they are very young, with a mean age of 19.96 years) associated with high expectations of easily finding a job after graduation.

The results obtained are presented in Table 5.

A chi square test was conducted to determine whether there was an association between school and students' entrepreneurial intention. A significant relationship was present between school and the first intention question ("If you had to choose between your own business and being hired by someone, what would you prefer?") ( $\chi^2 = 13.505$  (6), p=0.036) and the second intention question ("How likely are you to be self-employed?") ( $\chi^2 = 14.254$  (6), p=0.027).

**Table 5:** Students' entrepreneurship Intention



	Total		Engineering School		Management School	
	n	%	N	%	n	%
<b>"If you had to choose between your own business and being hired by someone, what would you prefer?"</b>						
I would rather be hired by someone (-3)	31	7.11%	12	5.61%	19	8.56%
-2	38	8.72%	21	9.81%	17	7.66%
-1	31	7.11%	22	10.28%	9	4.05%
0	65	14.91%	34	15.89%	31	13.96%
+1	74	16.97%	39	18.22%	35	15.77%
+2	113	25.92%	55	25.70%	58	26.13%
I would rather have my own business(+3)	84	19.27%	31	14.49%	53	23.87%
Positive responses (sum 1+2+3)	271	62.16%	125	58.41%	146	65.77%
<b>"How likely are you to be self-employed?"</b>						
Unlikely (-3)	27	6.19%	13	6.07%	14	6.31%
-2	31	7.11%	14	6.54%	17	7.66%
-1	51	11.70%	33	15.42%	18	8.11%
0	104	23.85%	59	27.57%	45	20.27%
+1	117	26.83%	55	25.70%	62	27.93%
+2	80	18.35%	28	13.08%	52	23.42%
Very Likely (+3)	26	5.96%	12	5.61%	14	6.31%
Positive responses (sum 1+2+3)	223	51.15%	95	44.39%	128	57.66%
<b>"How likely are you to work in an organization?"</b>						
Unlikely (-3)	1	0.23%	0	0.00%	1	0.45%
-2	6	1.38%	2	0.94%	4	1.81%
-1	12	2.76%	5	2.35%	7	3.17%
0	60	13.82%	32	15.02%	28	12.67%
+1	135	31.11%	64	30.05%	71	32.13%
+2	144	33.18%	74	34.74%	70	31.67%
Very Likely (+3)	76	17.51%	36	16.90%	40	18.10%
Positive responses (sum 1+2+3)	355	81.80%	174	81.69%	181	81.90%

## 5. Conclusions

In order to raise awareness and arouse individuals' interest in entrepreneurship, several authors call for the role that educational institutions should play in creating initiatives for young students to develop tools and new business ideas. Since technical and academic knowledge are important for the creation of an entrepreneur, students of engineering and socio-economic sciences have been mentioned by several studies as the individuals, who due to their technical skills will have a greater aptitude to build businesses with great success.

The EMPREENDE 2017 Project had as main objectives to understand and compare the entrepreneurial potential of the students of engineering and management. Taking into account the proposed objectives, a survey among graduation students from University of Minho allowed a total of 436 responses. The student's entrepreneurial intention and the factors that could influence it (attitude, subjective norms and perceived behaviour control) were compared between the two groups of students: 1) students of the Engineering School, 2) students of the Management School.

The study identified statistically significant differences between schools concerning attitudes towards entrepreneurship; subjective norms for entrepreneurship; perceived behaviour control in entrepreneurship and entrepreneurship intention. Results suggest a higher awareness from management students when compared with their engineering colleagues:

- have an higher attitude towards entrepreneurship,
- perceive a higher support from family and friends for entrepreneurship,
- have a higher perceived behaviour control in entrepreneurship
- show a higher entrepreneurship intention

What can explain the differences identified? First, the higher attitude of management students can be explained by being more aware of the theme of entrepreneurship, especially in the school context. Second, the increased family and friends support perceived by student management may result from positive reinforcement from peers and friends (an analysis at response levels revealed strong pro-entrepreneurship support from siblings, boyfriends, and friends). Third, management students possess a specific knowledge that is considered important in the creation of a business of their own, that is, the financial, strategic and economic



viability of a business, something that engineering students may not be so keen on. Finally, the highest intention is the result of the combination of the stated factors.

Despite the growing number of studies on entrepreneurial intention, studies on entrepreneurship in engineering are scarce in Portugal. The present study intends to contribute to the discussion of the theme of entrepreneurial intention in students of higher education, in particular comparing the students of engineering with the students of management. Although not generalizable, the conclusions result in important insights of the entrepreneurial intention, revealing differences based on the context of the students' academic formation.

Compared with their management colleagues, the results of engineering students suggest the need for greater awareness-raising and preparation for entrepreneurship as a future work option.

## **Acknowledgements**

The authors wish to acknowledge the support of ALGORITMI Research Centre at University of Minho. This work has been supported by COMPETE: POCI-01-0145-FEDER-007043 and FCT – Fundação para a Ciência e Tecnologia within the Project Scope: UID/CEC/00319/2013.

## **References**

- Ajzen, I. (1991) "The theory of planned behavior", *Organizational Behavior and Human Decision Processes*, Vol 50. No. 2, pp 179-211.
- Baptista, R., Escária, V. and Madruga, P. (2008) "Entrepreneurship, regional development and job creation: the case of Portugal", *Small Business Economics*, Vol 30, No. 1, pp 49-58.
- Belas, J. and Ključnikov, A. (2016) "The most important attributes of entrepreneurs. Case study of the environment of Czech SMEs", *International Journal of Entrepreneurial Knowledge*, Vol 4, No. 1, pp 104-111.
- Bhandari, N.C. (2012) "Relationship between students' gender, their own employment, their parents' employment, and the students' intention for entrepreneurship", *Journal of Entrepreneurship Education*, Vol 15, pp 133-144.
- Bryson, J., Sancino, A., Benington, J. and Sørensen, E. (2017) "Towards a multi-actor theory of public value co-creation", *Public Management Review*, Vol 19, No. 5, pp 640-654.
- Carr, J.C and Sequeira J.M. (2007) "Prior family business exposure as intergenerational influence and entrepreneurial intent: a Theory of Planned Behavior approach", *Journal of Business Research*, Vol 60, No. 10, pp 1090-1098.
- De Jorge-Moreno, J., Laborda Castillo, L. and Sanz Triguero, M. (2012) "The effect of business and economics education programs on students' entrepreneurial intention", *European Journal of Training and Development*, Vol 36, No. 4, pp 409-425.
- Duval-Couetil, N., Shartrand, A. and Reed, T. (2016) "The role of entrepreneurship program models and experiential activities on engineering student outcomes", *Advances in Engineering Education*, Vol 5, No.1, pp 1-27.
- Fretschner, M. (2014) "Ajzen's Theory of Planned Behavior in Entrepreneurship Education Research: An Introduction and Review of Impact Studies". In *Becoming an Entrepreneur*, Weber S.; F. Oser; F. Achtenhagen; M. Fretschner; and S. Trost (Eds.). Sense Publishers, pp 249-277.
- Gird, A. and Bagraim, J.J. 2008 "The theory of planned behaviour as predictor of entrepreneurial intent amongst final-year university students", *South African Journal of Psychology*, Vol 38, No. 4, pp 711-724.
- Global Entrepreneurship Monitor Research Association (2017) *Global Report 2016/17*. Retrieved from: <http://gemconsortium.org/report/49812>
- Hisrich, R.D., Peters, M.P. and Shepherd, D.A. (2014) *Empreendedorismo-9*, AMGH Editora.
- Guerrero, M., Rialp, J. and Urbano, D. (2008) "The impact of desirability and feasibility on entrepreneurial intentions: a structural equation model", *International Entrepreneurship and Management Journal*, Vol 4, No. 1, pp 35-50.
- Honjo, Y. (2015) "Why are entrepreneurship levels so low in Japan?", *Japan and the World Economy*, Vol 36, pp 88-101.
- Koh, H. C. (1996) "Testing Hypotheses of entrepreneurial characteristics: A Study of Hong Kong MBA Students", *Journal of Managerial Psychology*, Vol 11, No. 3, pp 12-25.
- Krueger, N.F., Reilly, M. and Carsrud, A.L. (2000) "Competing models of entrepreneurial intentions", *Journal of Business Venturing*, Vol 15, No. 5, pp 411-432.
- Küttim, M., Kallaste, M., Venesaar, U. and Kiis, A. (2014) "Entrepreneurship education at university level and students' entrepreneurial intentions", *Procedia-Social and Behavioral Sciences*, Vol 110, pp 658-668.
- Laspita, S., Breugst, N., Heblich, S. and Patzelt, H. (2012) "Intergenerational transmission of entrepreneurial intentions", *Journal of Business Venturing*, Vol 27, No. 4, pp 414-435.
- Lee, L., Wong, P.K., Foo, M.D. and Leung, A. (2011) "Entrepreneurial intentions: The influence of organizational and individual factors", *Journal of Business Venturing*, Vol 26, No. 1, pp 124-136.
- Liñán, F. and Fayolle, A. (2015) "A systematic literature review on entrepreneurial intentions: citation, thematic analyses, and research agenda", *International Entrepreneurship and Management Journal*, Vol 11, No. 4, pp 907-933.
- Liñán, F., Rodríguez-Cohard, J.C. and Guzmán, J. (2011) "Temporal stability of entrepreneurial intentions: a longitudinal study". In *Entrepreneurship Research in Europe: Evolving Concepts and Processes*, O. J. Borch, A. Fayolle, P. Kyrö and E. Ljunggren (Eds.). Cheltenham, UK: Edward Elgar, pp 34-55.

- Maes, J., Leroy, H. and Sels, L. (2014) "Gender differences in entrepreneurial intentions: A TPB multi-group analysis at factor and indicator level", *European Management Journal*, Vol 32, No.5, pp 784-794.
- Matlay, H., Solesvik, M. and Westhead, P. (2014) "Cultural factors and entrepreneurial intention: The role of entrepreneurship education", *Education + Training*, Vol 56, No. 8/9, pp 680-696.
- Mayhew, M.J., Simonoff, J.S., Baumol, J.W., Selznick, S.B. and Vassallo S.J. (2016) "Cultivating innovative entrepreneurs for the twenty-first century: A study of US and German students", *The Journal of Higher Education*, Vol 87, No. 3, pp 420-455.
- Maresch, D., Harms, R., Kailer, N. and Wimmer-Wurm, B. (2016) "The impact of entrepreneurship education on the entrepreneurial intention of students in science and engineering versus business studies university programs", *Technological Forecasting and Social Change*, Vol 4, pp 172-179.
- Obschonka, M., Silbereisen, R.K. and Schmitt-Rodermund, E. (2010) "Entrepreneurial intention as developmental outcome", *Journal of Vocational Behavior*, Vol 77, No. 1, pp 63–72.
- Oosterbeek, H., Van Praag, M. and Ijsselstein, A. (2010) "The impact of entrepreneurship education on entrepreneurship skills and motivation", *European Economic Review*, Vol 54, No. 3, pp 442–454.
- Peterman, N.E. and Kennedy, J. (2003) "Enterprise education: Influencing students' perceptions of entrepreneurship", *Entrepreneurship Theory and Practice*, Vol 28, No. 2, pp 129–144.
- Rahman, S.A., Ahmad, N.H. and Taghizadeh, S.K. (2016) "Entrepreneurial competencies of BoP entrepreneurs in Bangladesh to achieve business success", *Journal of General Management*, Vol 42, No. 1, pp 45-63.
- Raijman, R. (2001) "Determinants of entrepreneurial intentions: Mexican immigrants in Chicago", *Journal of Socio-Economics*, Vol 30, pp 393–411.
- Reynolds, P., Bosma, N., Autio, E., Hunt, S., De Bono, N., Servais, I., Chin, N. (2005) "Global entrepreneurship monitor: Data collection design and implementation 1998–2003", *Small Business Economics*, Vol 24, No. 3, pp 205-231.
- Sarkar, S. (2010) *Empreendedorismo e Inovação*, Escolar Editora.
- Shapiro, A. and Sokol, L. (1982) "Social dimensions of entrepreneurship". In *Encyclopedia of Entrepreneurship*, C.A. Kent, D.L. Sexton and K.H. Vesper (Eds.), Englewood Cliffs: Prentice Hall, pp 72–90.
- Solesvik, M.Z. (2013) "Entrepreneurial motivations and intentions: investigating the role of education major", *Education + Training*, Vol 55, No. 3, pp 253-271.
- Souitaris, V., Zerbini, S. and Al-Laham, A. (2007) "Do entrepreneurship programmes raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources", *Journal of Business Venturing*, Vol 22, pp 566–591.
- Van Praag, C.M. (1999) "Some classic views on entrepreneurship", *De Economist*, Vol 147, No. 3, pp 311–335.
- Van Stel, A., Carree, M. and Thurik, R. (2005) "The effect of entrepreneurial activity on national economic growth", *Small Business Economics*, Vol 24, No. 3, pp 311-321.
- Von Graevenitz, G., Harhoff, D. and Weber, R. (2010) "The effects of entrepreneurship education", *Journal of Economic Behavior & Organization*, Vol 76, pp 90–112.
- Wyrwich, M. (2015) "Entrepreneurship and the intergenerational transmission of values", *Small Business Economics*, Vol 45, No. 1, pp 191-213.
- Zhang, Y., Duysters, G. and Cloudt, M. (2014) "The role of entrepreneurship education as a predictor of university students' entrepreneurial intention", *International Entrepreneurship and Management Journal*, Vol 10, No. 3, pp 623-641.
- Zhao, H., Hills, G.E. and Siebert, S.E. 2005 "The mediating role of self-efficacy in the development of entrepreneurial intentions", *Journal of Applied Psychology*, Vol 90, No. 6, pp 1265–1272.