Exploration of employability perceptions with blended multicriteria decision making methods

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Abstract

Purpose – The purpose of this paper is to explore employment perception of students as a relevant indicator of higher education quality, using blended multicriteria decision making methods.

Design/Methodology/approach – The differential impact of these variables was analyzed in this paper taking a sample of 641 students and six higher education lecturers identified as experts on young vocational careers. The traditional study of student behavior and perceptions of employability does not incorporate the uncertainty associated with multi-criteria decision processes and is therefore less adapted to the human reasoning process. This research applies traditional techniques together with Fuzzy techniques capable of managing more effectively the uncertainty associated with student actions and behaviors.

Findings – This research shows that it is important to consider previous work experience, academic achievement, and soft skills developed during education experiences. In this way, this research shows the lecturers how to adapt their pedagogical practices according to students' perceptions of employability and assess their students' perceptions of employability. In addition, lecturers will be able to incorporate the uncertainty associated with decision making processes to optimize employability perception.

Originality/value – Higher Education related research on uncertainty environments as multicriteria decision problems is still in early stages. The incorporation of the uncertainty associated with decision making processes to this field allows to optimize employability perception thanks to its adaptation to real human behavior in the adoption of decisions.

Keywords Higher education, employability, vocational career, AHP, TOPSIS, fuzzy.

Paper type Research paper

Introduction

Several approaches to the concept of employability have been presented in the literature, across several disciplinary fields and from different perspectives. From an educational perspective, researchers have paid particular attention to the contributions of higher education on development of graduates' skills in order to be better prepared for labor market transition (Yorke and Knight, 2004; Dacre Pool and Sewell, 2007; Bridgstock, 2009).

In this process, individuals' perceptions are highlighted by authors such as Rothwell, Herbert and Rothwell (2008) in the definition of employability as a "perceived ability to attain sustainable employment appropriate to one's qualification level" (p.2). The relevance of individuals' perceptions is equally present in several employability models, such as the USEM model (Understanding, Skills, Efficacy beliefs, and Metacognition; Yorke and Knight, 2004), the CareerEdge model (Dacre Pool and Sewell, 2007) or the career management model proposed by Bridgstock (2009). In such perspectives, self-perceptions are seen as an important link between employability and knowledge, understanding, skills, experience and personal attributes (Dacre Pool and Sewell, 2007). Indeed, it is by the engagement in reflective, evaluative and decision-making processes that student will be able, not only to effectively acquire, but also to exhibit their skills that will promote career opportunities. In this sequence, self-perceptions need to be considered for the understanding of employability (Bridgstock, 2009).

The development of such perceptions of employability, particularly in the context of previous individuals' experiences, is still under-researched (Rothwell et al., 2008; Wittekind et al., 2010; Turner, 2014). One particular aspect important to tackle refers to the way academic staff, namely lecturers, perceive the development of such students' self-beliefs. Lecturers have a crucial role on the way students develop and perceive their skill improvements and achievements (Ayllón et al., 2019; Van Dinther et al., 2011). This enhances the relevance to explore the consistency between academic staff perceptions about students' perceived employability and effective students' perceptions about their employability. This understanding will inform how and where efficacy beliefs can be addressed by lecturers as a way to promote graduates' employability (Turner, 2014; Jackson and Wilton, 2017).

However, studying these variables is not an easy task as multi-criteria decision making is purpose to many subjective judgements and therefore difficult to quantify in a simple way the importance of each variable within the evaluation model. This is why fuzzy methodologies are increasingly used to solve

multi-criteria decision-making problems thanks to the use of a fuzzy language that is closer to human reasoning (Castro-Lopez et al., 2021). In this article we use fuzzy methodologies FAHP and FTOPSIS to analyze employability perceptions and establish a proper lecturing innovation plan in order to improve students' perceptions in terms of employability considering their respective scientific area of graduation. Specifically, the research questions in this paper are: Which factors are perceived by professors as relevant for students' perceived employability? Are professors' perceptions about students' perceived employability consistent with effective students' perceptions about their employability? Are these perceptions differentiated in function of scientific area of students´ graduation?

Theoretical framework

Graduate unemployment affects countries all over the world (Eliška, 2016; Chadha and Toner, 2017), and this expectation of unemployment can discourage students from completing their studies. In consequence, higher education institutions are today more attentive to this reality and feel the need to explore new ways to promote the graduate employability of their students (Milner et al., 2016). The research in this field is increasingly multidisciplinary and addresses more diverse topics (Díaz, 2019), for example to explore the promotion and assessment of competence-based learning (Wolff and Booth, 2017), to examine whether we are really giving sufficient importance to training in transversal competences (Dieste, et al., 2019), to find out whether curricula are adapted to labour market needs (Fernández, 2017), and to assess whether universities are really implementing plans to promote the employability of their graduates (Chadha and Toner 2017).

In the research on employability, there are some works that consider the study of the subject's personal variables (González and Martínez, 2016; Izquierdo and Farias, 2018) and ask basic questions such as are our students prepared for access to the labor market? And even more so, do they perceive themselves competent to successfully access the professional world?

Work experience and perceived employability

Work experience during higher education has been generally accepted as influencing positively further employability, particularly when related with the study field (Blackwell et al., 2001; Helyer and Lee, 2014; Irwin et al., 2019) and when integrated in study programs (Kamaliah et al., 2018; Irwin et al., 2019; Jackson and Bridgstock, 2020). The literature has provided substantial evidence that practical experience represents an effective way to develop a sense of efficacy, enabling the application and articulation of knowledge and skills (Van Dinther et al, 2011; Monteiro et al., 2016;Jackson and Wilton, 2017), particularly in relation to the confidence in making applications and/or attending interviews, in demonstrating skills and strengths and taking career decisions (Edwards, 2014).

Work experiences also contribute to the development of a clearer understanding of the world of work and to gaining experience and skills (Beavis et al., 2005; Jackson and Wilton, 2017; Jackson and Bridgstock, 2020). However, such positive relationship seems to be not so linear when considering the case of worker students who have to conciliate academic and professional responsibilities. Such students might have less available time to invest in their academic work and in other activities that can proportionate career opportunities, comparing with "traditional" students (Osborne et al., 2004; Humphrey, 2006). In addition, research highlights that university students who have full-time jobs that do not correspond to the studies they are currently pursuing, can have lower academic achievement than their colleagues (Yanbarisova, 2015; Byrne, 2020;). For these reasons, despite the potential benefits that might derive from work experiences, in some specific circumstances, work experience can affect negatively students' perceptions of employability.

Academic achievement and perceived employability

Academic achievement has been considered a key variable for understanding different events that arise in higher education. For example, high academic achievement, is one of the variables that best explains academic progress and permanence in college (Esteban et al., 2017; Casanova et al., 2018; Ferrão and Almeida, 2018). Academic achievement appears to affect students' self-perception during their studies. Students with low performance levels perceive academic activities as not meaningful and valuable, and are less motivated because their motivation tends to be extrinsic, have lower self-esteem and tend to make little effort (Martínez, 2009). Also students with positive academic self-perceptions were more likely to work hard and devote more time to their studies than students with negative academic self-perceptions (Meltzer et al., 2004).

Taking the perspective of university to work transition, new graduates with higher academic achievement have increased chances to be called for selection and recruitment processes and to obtain career rewards in terms of employment and salary (Mckinney et al., 2003; Imose and Barber, 2015). Moreover, research examining the effect of academic achievement in perceived employability in business graduates have corroborated the positive relation between these two variables (Pinto and He, 2019; Pinto and Ramalheira, 2017; Tentama and Abdillah, 2019). Despite that, some authors have also argued that such positive relationship might not be linear and irrefutable, particularly in contexts or scientific areas where the job market demand is lower than the number of available graduates to work. For example, in a recent study with final-year graduates, Tomlinson (2018) concludes that despite students' recognition of academic credentials as a significant dimension for employability, students increasingly consider the importance to add value to those credentials. Therefore, the increased labor market competition seem to generate uncertainty about what students and new graduates can expect from higher education (Tymon, 2013; Clarke, 2018; Jorre de St Jorre and Oliver, 2018; Jackson and Tomlinson, 2020), and this can contribute to some devaluation of academic credentials, including academic achievement.

Educational experiences and perceived employability

Since the implementation of the European Higher Education Area (EHEA), European universities have found it necessary to work on the restructuring of their different curricula, seeking to respond to the demands of today's society, offering students and society in general a higher education system based on excellence (Villamizar el al., 2014). In order to achieve this purpose, the institutions have changed the teaching-learning approach in order to prepare students to face the labor market. Higher education, has to be able to train the students not only in the theoretical-practical contents of the career but also has to train students to adapt to the constant changes brought by the knowledge society given the quick expiration implicit in the training and information in this society (Gonzalez et al., 2016).

In addition, nowadays, universities are challenged with the task of training students in a series of transversal competencies that are key to both academic success and adaptation to the labor market. In this way, employers and employees highly value the ability to leadership, teamwork, communication skills, initiative and willingness to change, for example (Jato et al., 2016). Consequently, the success on social and labor market insertion will depend on proper basic training that allows to adapt the students´ qualification to the labor market and their social and professional skills that configure the different job profiles. Therefore, it might be expected that positive educational experiences during higher education will be positively related with higher perceived employability by students. Employability is enabled by the construction of students' understandings from personal experience, combined with pedagogical approaches that promote learning and positive engagement (Knight and Yorke, 2002; Dacre Pool and Sewell, 2007; Bridgstock, 2009; Monteiro, Almeida et al., 2020). Several empirical studies have already demonstrated this positive impact of competencies development on perceived employability (Qenani et al., 2014; Alvarez et al., 2017), particularly when mediated by career management skills (Jackson and Bridgstock, 2020; Monteiro, Ferreira, et al., 2020).

Method

In this research we are particularly interested to develop previous research about student's perceptions of employability (García-Aracil et al., 2018), focusing mainly in work experience, academic achievement and educational experiences, and to explore how such perceptions are consistent with lecturers' perceptions about this process. For this purpose, a survey was carried out among students from a public Portuguese university to find out their perception of work experience, academic achievement and educational experience importance in that transition. Also, a group of lecturers have been questioned about their employability perceptions. In particular, we use fuzzy methodologies FAHP and FTOPSIS to determine the importance of the different criteria that define the perception of employability and to establish their ranking into different scientific areas of graduation.

A convenience sample of 641 students, 59% male and 41% female, was considered. Participants were in the final-year of their master courses, representing four different subject areas of a public university in north of Portugal: Economics (31%), Human and Social Sciences (27%), Law (11%) and Engineering (31%). The average mean was 25.71 years old (*SD* = 6.81). One hundred and eighty-two students (28.4%) reported already have had a work experience (study-related or not).

Three independents variables were expected to have a positive impact on students', described hereafter: *Work experience,* represented by a dichotomous item whereby students indicated if they have any type of paid professional activity, whether or not related to their field of study; *Academic achievement*,

represented by the average academic achievement at the end of their degree (0 to 20 scale where 10 points starts a positive or passed classification); and *Educational experience,* represented by students' evaluation of their university education quality, in a 5 point Likert scale, taking for this purpose a set of ten competencies and knowledge domains: theoretical knowledge, practical knowledge, communication, methodological, interpersonal, participatory, organizational, socioemotional, generic and employability competencies. Scale unidimensionality was observed by Cronbach Coefficient Alpha (.863) and McDonald Omega coefficient (.864), as well as satisfactory adjustment to one factor model ($\chi 2/df$ = 6.62; CFI = 0.909; TLI = 0.858; RMSEA = 0.094). In this study *employability perception* was assessed asking students about their preparation to the labour market. For that, a 5-point Likert item was used, through which participants indicated their overall preparation perception to the labour market.

Concerning lecturers´ perceptions, an online meeting was scheduled with six higher education lecturers with the aim to enquire them about the weight of each of the three factors theoretically identified as potentially relevant for students' perceived employability (academic achievement, work experience and educational experience). For this purpose, an evaluation matrix of these three criteria - C1: Academic achievement; C2: Work experience; C3: Educational experience - was presented for each participant to fill in, as represented in Figure 1.

Students' perception of preparation to the labour market

	More important than								Equal	Less important than							
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9
C1																	C2
C1																	C3
C1																	C4

Figure 1. Evaluation matrix for evaluation of the three criteria.

Different methodologies were used to analyze lecturers' perceptions of the impact of those three independent variables on students´ employability.

Multi-criteria decision-making (MCDM)

The multi-criteria decision-making theory approach has become an important means of providing real-time solutions to uncertainty problems (Stojcic et al., 2019). MCDM is expressed as a decision-making method to establish the best alternative of a number of alternatives based on certain criteria (Santoso et al., 2019). The most common methods used in MCDM are Weighted sum model (WSM), Weighted product model (WPM), Compromise programming (CP), Analytical hierarchy process (AHP), Elimination and Choice Expressing Reality method (ELECTRE), Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), Preference ranking organization method for enrichment evaluation (PROMETHEE), Serbian Multicriteria Optimization and Compromise Solution (*VlseKriterijuska optimizacija I komoromisno resenje*, VIKOR), Weighted aggregated sum product assessment (WASPAS), Multi-Attribute Utility Theory (MAUT) (Kabir et al., 2014; Bidoux et al., 2019; Sitorus et al., 2019). Usually, the multi-criteria decision-making methods are based on numerical scales (crisp data). However, the human preferences and judgments are often imprecise and vague. So, the use of linguistics assessments to describe the variables and the weights importance allow a better realistic approach thanks to artificial intelligent tools as Fuzzy Sets theory (Zadeh, 1965).

Fuzzy Analytic Hierarchy Process (FAHP)

AHP is one of the most common used methods in multi-objective decision making problems (Vaidya and Kumar, 2006; Mardani et al., 2015; Bunyan Unel and Yalpir, 2019) AHP methodology developed by Saaty (1980) allows for multi-criteria assessments in regard to decision making based on importance comparisons between the factors involved in the decision making (Saaty, 1996). Nevertheless, there is still weakness that AHP based decision making inevitably involves decision maker's subjectivity in determining the preference for evaluation objectives (Kim et al., 2020). To solve this problem, Fuzzy AHP (FAHP) is proposed to address the issue of ambiguity and uncertainty resulting from this characteristic of AHP method. This methodology emerges as a combination of the traditional AHP (Saaty, 1980) with the fuzzy sets Theory (Zadeh, 1965). The use of FAHP highlighted the quality of this

technique based on expert judgment (Bajic et al., 2020), being able to include the associated uncertainty in decision making, enabling to improve the consistency and flexibility of the results (Van Laarhoven and Pedrycz, 1983).

In order to maintain a strategy of distance to these assessments, a fuzzy model is created using Fuzzy AHP capable of providing more complete, adaptable and practical results (Meshram et al., 2019) to the proposed assessment model. The Fuzzy AHP method consists of four phases (Yu et al., 2011): (1) define the AHP structure; (2) stablish the pair comparison matrix; (3) weight calculation for each criterion; and (4) consistence test.

To define the AHP structure for the multi criteria decision problem it is necessary to establish different steps (Albayrak and Erensal, 2004): (1) the goal to be achieved, (2) the criteria for the evaluation, and (3) the alternatives definition. Each criteria or alternative in the hierarchy can be broken down into explanatory elements, and as many as necessary should be used. Then, to establish the pair comparison matrix, which allows the decision maker to establish importance by comparing in pairs. In this point, the crisp values have been replaced by fuzzy values more adequate to natural language. The use of fuzzy values is more attractive, easier to use and more assimilable to real life than numerical ones (Ishizaka and Labib, 2011). Table 1 shows the Fuzzified Satty's nine-scale for triangular fuzzy number (Bajic et al., 2020; Kim et al., 2020).

Table 1
Fuzzy AHP scale

Linguistic variable	AHP Value	FAHP Scale Triangular Fuzzy Number ($0.5 \leq \alpha \leq 2$)
Equal	1	$(1, 1, 1 + \alpha)$
Weak	3	$(3 - \alpha, 3, 3 + \alpha)$
Strong	5	$(5 - \alpha, 5, 5 + \alpha)$
Very strong	7	$(7 - \alpha, 7, 7 + \alpha)$
Absolute	9	$(9 - \alpha, 9, 9)$
Intermediate values	2,4,6,8	$(x - 1, x, x + 1)$ $x = 2, 4, 6,8$

To determine this consistency, Saaty (1980) defines the so-called consistency ratio for each of the matrices established in the previous phase. The consistency ratio (CR) is used to directly estimate the consistency of the comparison pairs and is expressed as indicate Eq. 1.

$$CR = \frac{CI}{RI} \quad (1)$$

Where CI is the consistency coefficient and RI is the random index is calculated with Eq. 2, which indicates the consistency ratio of a random matrix, that confirm if the comparison is or not acceptable. Table developed by Saaty (1980) (Table 2) established a relationship between consistency ratios and the number of criteria used to analyze the proposed model.

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (2)$$

Where λ_{max} is the maximum self-value and n is the dimension of the decision matrix.

Table 2
Consistency ratio

n	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

Once the consistency has been calculated, the weights are obtained, which represent the relative importance of each criterion. To do this, the method of the self-values described in the following expression is used (see Eq. 3).

$$A\,w = \lambda_{max}\,w \quad (3)$$

Where A represents the comparison matrix, w the autovector or preference vector, and λmax the autovalue. Later, once the weights have been calculated and the consistency of the assessments confirmed. Finally, defuzzified each consistent expert's judgement using the Converting the Fuzzy data into Crisp Scores (CFCS) method (Opricovic and Tzeng, 2003), calculate integrate crisp matrix, and final weights (Nazari-Shirkouhi et al., 2017).

FTOPSIS method

TOPSIS methodology developed by Hwang and Yoon (1981), seeks to order the alternative solutions to a problem according to preferences for similarity to an ideal solution (ranking method). According to this methodology, the best alternative must have two characteristics: be the closest to the positive ideal solution and the farthest from the negative ideal solution (Chen et al., 2006). The FTOPSIS method consist on three steps: (1) fuzzy variation matrix for each criterion; (2) standardized and Weighted Decision Matrix; and (3) closeness coefficients for each alternative and ranking. The first step is to calculate the fuzzy valuation matrix of the criteria. In this regard, Ci (i=1…n) are the evaluation criteria and Aj (j=1…m) are the alternatives solution to be ranked. The fuzzy decision matrix has the structure presented in Eq.4.

$$\left[\widetilde{D}_x\right] = \begin{array}{c} \\ A_1 \\ A_2 \\ \cdots \\ A_i \\ \cdots \\ A_m \end{array} \begin{array}{c} \begin{array}{cccccc} C_1 & C_2 & \cdots & C_j & \cdots & C_n \end{array} \\ \begin{pmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \ldots & \ldots & \ldots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}_{22} & \ldots & \ldots & \ldots & \tilde{x}_{2n} \\ \ldots & \ldots & \ldots & \ldots & \ldots & \ldots \\ \ldots & \ldots & \ldots & \tilde{x}_{ij} & \ldots & \ldots \\ \ldots & \ldots & \ldots & \ldots & \ldots & \ldots \\ \tilde{x}_{m1} & \tilde{x}_{m2} & \ldots & \ldots & \ldots & \tilde{x}_{mn} \end{pmatrix} \end{array} \quad (4)$$

Where $\tilde{x}_{ij}$ be the fuzzy valuation of criterion "j" in the alternative "i" –a consensual triangular fuzzy number for that valuation-: $\tilde{x}_{ij} = (x_{ij1}, x_{ij2}, x_{ij3})$.

Later, in order to establish the standardised and weighted decision matrix, a homogenisation has to be carried out to measurement the criteria in the interval [0, 1] in line with the Eq. 5.

$$\tilde{x}_{ij}^{*} = \frac{\tilde{x}_{ij}}{max_j(x_{ij3})} = \left(\frac{x_{ij1}}{max_j(x_{ij3})}, \frac{x_{ij2}}{max_j(x_{ij3})}, \frac{x_{ij3}}{max_j(x_{ij3})}\right) = \left(x_{ij\,1}^{*}, x_{ij\,2}^{*}, x_{ij\,3}^{*}\right) \quad (5)$$

The fuzzy weight of each criteria $\tilde{W}_j = (w_{j_1}, w_{j_2}, w_{j_3})$ is calculated by accord. In this case we use the pairwise comparison obtained the previous FAHP method. Then, the standardized elements and weighted decision matrix are calculated according to Eq. 6.

$$\tilde{v}_{ij} = \tilde{W}_j * \tilde{x}_{ij}^{*} = \left(w_{j_1} * x_{ij\,1}^{*}, w_{j_2} * x_{ij\,2}^{*}, w_{j_3} * x_{ij\,3}^{*}\right) \quad \text{i} = 1,2,...\text{m}; \text{j} = 1,2,...\text{n} \quad (6)$$

Afterwards, in order to calculate the closeness coefficients for each alternative and stablish the ranking, the fuzzy positive (A^+) and negative(A^-) ideal solution chose the optimum fuzzy value from all alternatives for each criterion, liable on their nature (benefit criteria "Cb" or cost criteria "Cc") such illustrate Eq. 7 and Eq. 8.

$$A^+ = \left\{\tilde{v}_1^+, \tilde{v}_2^+, ..., \tilde{v}_n^+\right\} \quad \wedge \quad \tilde{v}_j^+ = \begin{cases} \max_i \tilde{v}_{ij}, \, if \, j \in Cb \\ \min_i \tilde{v}_{ij}, \, if \, j \in Cc \end{cases} \quad i = 1,2,...m; \; j = 1,2,...n \quad (7)$$

$$A^- = \left\{\tilde{v}_1^-, \tilde{v}_2^-, ..., \tilde{v}_n^-\right\} \quad \wedge \quad \tilde{v}_j^- = \begin{cases} \min_i \tilde{v}_{ij}, \, if \, j \in Cb \\ max_i \tilde{v}_{ij}, \, if \, j \in Cc \end{cases} \quad i = 1,2,...m; \; j = 1,2,...n \quad (8)$$

By using benefit criteria, real numbers "1" and "0" are usually chosen – in their fuzzy representation -, to express the components of A^+ and A^- respectively (see Eq. 9):

$$\tilde{v}_j^+ = (1,1,1); \; \tilde{v}_j^- = (0,0,0); \; \forall \text{j} = 1,2,...,\text{n}. \quad (9)$$

Then, positive and negative distances to the ideal solution are calculated according equations (10) and (11) from each alternative to the positive and negative ideal solutions can be calculated by using equations (9), where $d\left(\tilde{v}_{ij}, \tilde{v}_j^+\right)$ is the distance among these fuzzy numbers.

$$d_i^+ = \sum_{j=1}^{n} d\left(\tilde{v}_{ij}, \tilde{v}_j^+\right) \quad \text{i} = 1,2,...,\text{m}; \; \text{j} = 1,2,...,\text{n}. \quad (10)$$

$$d_i^- = \sum_{j=1}^{n} d\left(\tilde{v}_{ij}, \tilde{v}_j^-\right) \quad \text{i} = 1,2,...,\text{m}; \; \text{j} = 1,2,...,\text{n}. \quad (11)$$

The final step is to calculate the closeness coefficient of each alternative "*i*" according with the equation (12) in order to establish the ranking of the alternatives.

$$CC_i = \frac{d_i^-}{d_i^- + d_i^+} \quad \forall i = 1,2,...m \tag{12}$$

Results

Starting with students´ results, Table 3 presents the descriptive statistics of the variables that compose the model evaluated. The results indicate that overall students' perceptions of their preparation to the labour market are positive, although slightly lower than their perceptions about educational experience during higher education studies. Students' academic achievement is in average positive, scoring 14 point in 0-20 points scale. The majority of the participants reported having already had some kind of professional experience. Measures of skewness and kurtosis were well within accepted ranges of -2 and 2 (George and Mallery, 2010).

Table 3
Descriptive Statistics of the variables of the validation mode

Results obtained from the linear regression analysis are presented in Table 4. These data confirm that educational experience is a significant predictor of students' perceptions of preparation to the labour market. The variable that measure work experiences is close to, although not reaching significant values for the explanation of the criterion variable. In turn, academic achievement did not show any significant effect on the explanation of preparation to the labour market. Adjusted R^2 of .269 indicates reasonable

Predictor	***B***	**SE**	***β***	***p* value**
Academic achievement	-0.027	0.020	-0.049	.176
Educational experience	0.434	0.030	0.518	.000**
Work experiences	-0.116	0.061	-0.069	.060
R^2			0.273	
Adjusted R^2			0.269	

model fit and the model is significant (F(3, 557) = 69.608, p < .000).

Table 4
Regression analysis with predictors of preparation to the labour market

Table 5 shows an example for one expert evaluation and the importance weights of each criteria in the model that analyses the students' perception of their preparation for the job market.

Variables		***M***	***SD***	***Kurtosis***	***Skewness***
Preparation to the labour market (1-5 points)		3.34	.84	-.364	.126
Academic achievement (0-20 points)		14.19	1.54	-.068	-.548
Educational experience (1-5 points)		3.63	.55	-.366	.109
				N (%)	
Work experience	Yes (1)			384 (60.1%)	
	No (2)			255 (39.9%)	

Table 5
Example of pair-wise comparison matrix between criteria (C)

	C1	C2	C3	Wi
C1: Academic achievement	1	2	9	0.595
C2: Work Experience	0.5	1	7	0.347
C3: Educational experience	0.11	0,14	1	0.058

As we can see in Table 5, the most important criteria for this expert in the employability perception, it is the academic achievement (0.595), following by work experience (0.347) and, finally, educational experience (0.058). Table 6 represents the results with the weights of each three criteria by six lecturers, assumed as experts.

Table 6
Weights results for each criteria (C) and expert (Exp)

	Exp1	Exp2	Exp3	Exp4	Exp5	Exp6
C1: Academic achievement	0.220	0.164	0.087	0.595	0.230	0.595
C2: Work Experience	0.713	0.297	0.750	0.347	0.122	0.347
C3: Educational experience	0.067	0.539	0.162	0.058	0.648	0.058

Results suggest the experts' 4 and 6 consider the academic achievement variable has the highest relevance for students' employability perceptions, and the expert 3 considers it less important than another. On the other hand, the work experience variable, in general has a good evaluation, especially for the expert 3 that consider the most important variable in the proposed model. Lastly, the educational experience variable has lower values, except for expert 5 that consider that this variable is important in the employment perception model. As we can see, there are different evaluations and each expert assumes different importance weights for each variable in the model. In order to homogenise this information, an aggregation of the results was made in terms of weights and consistency coefficients for this model that analyses the students' perception of their preparation for the job market. Table 7 shows the results of such aggregation.

Table 7
Aggregated results in terms of weights and consistence

	Weights	Index		
C1: Academic achievement	0.366	CI	RI	CR
C2: Work experience	0.484	0.001	0.525	0.002
C3: Educational experience	0.150	¿Consistence (CR<0.05)? Yes		

The consistency ratio (CR) of each pair-wise comparison judgment matrices is lower than 0.05. The experts' results aggregation allows to establish that the importance weight for each variable are consistent. As a result, it can be confirmed that the most important variable for the experts is Work experience (0.484), followed by Academic achievement (0.484) and finally, Educational experience (0.150).

After validating the individual and aggregated consistency of the results, the weights from this aggregation will be used to indicate the relevance of each criterion in the evaluation model in the next phase with the F-TOPSIS methodology. F-TOPSIS method allows to establish a ranking of the best study fields perceived by the students in terms of employability. Firstly, we introduce the weights results obtained in the previous AHP method. Later, to sort the four criteria according to their importance, it is necessary to defuzzified their values and order them decreasingly. Table 8 presents the importance weight of each criterion obtained.

Table 8
Fuzzy importance weights and BNP for the considered criteria

Criteria	Crisp weight	Fuzzy importance weights (TFN)			BNP	Weights Ranking
	W	W_1	W_2	W_3		
C1: Educational experience	0.366	0.52	0.61	0.76	0.632	1
C2: Academic achievement	0.484	0.00	0.06	0.40	0.153	3
C3: Work Experience	0.150	0.01	0.33	0.40	0.247	2

The averaged fuzzy valuations obtained for the different criteria for each academic degree divided in four knowledge areas (human and social sciences, economy, law and engineering) as shows in Table 9.

Table 9
Weighted fuzzy matrix by knowledge areas

	Human and social sciences			Economy			Law			Engineering		
C1	5.71	6.64	8.14	5.09	7.88	7.58	5.11	6.00	8.73	5.07	6.02	7.25
C2	0.00	0.63	4.00	0.00	0.69	4.00	0.00	0.67	4.00	0.00	0.45	4.00
C3	0.05	3.31	4.00	0.06	3.43	8,71	0.11	3.21	4.00	0.06	3.18	4.00

Finally, the distances from each criterion to the mentioned fuzzy ideal reference points and the closeness coefficient of each knowledge areas were calculated. The results for all the analysed university studies by knowledge area and their final ranking are illustrated in Table 10.

Table 10
Distances, closeness coefficients and university study

Knowledge area	d_i^+	d_i^-	CC_i	Ranking
Human and social sciences	4.92	1.34	0.215	4
Economy	4.62	1.73	0.272	2
Law	4.65	1.69	0.267	3
Engineering	4.60	1.76	0.276	1

The results of the assessment model on perceived employability, which integrates expert knowledge with the students' perceptions, reveal that the students most prepared for their future career are engineering students, followed by economics and law students, and finally human and social sciences students.

Conclusions

Students´ perceptions assume relevance on graduate employability and preparation for labor market transition (Yorke and Knight, 2004; Dacre Pool and Sewell, 2007; Bridgstock, 2009). In addition to understanding how students perceive themselves in terms of their employability it is important to explore how lecturers perceive such development of employability (Jackson and Wilton, 2017; Ayllón et al., 2019; Dieste et al., 2019).

In the literature three variables can be considered as influent on students´ employability perceptions and labor market transition: academic achievement, previous work experience and educational experience (Helyer and Lee, 2014; Esteban et al., 2017; Irwin et al., 2019; Jackson and Bridgstock, 2020). Nowadays, their relevance increases face the labor market competition and uncertainty (Clarke, 2018; Jorre de St Jorre and Oliver, 2018; Jackson and Tomlinson, 2020). In this context, Higher Education must assure an educational experience not reduced to the theoretical-practical contents of a profession. Several authors defend academic experience must include the development of transversal competencies like leadership, teamwork, communication skills, initiative or critical thinking, for example (Gonzalez et al., 2016; Jato et al., 2016; Monteiro, Ferreira, et al., 2020). Research shows an important impact of those competencies development on students´ perceived employability (Qenani et al., 2014; Alvarez et al., 2017; Jackson and Bridgstock, 2020; Monteiro, Ferreira, et al., 2020).

Regression analysis on students´ perceived employability suggest a significant contribution of academic achievement, previous work experience and educational experience, explaining 27% of employability perception variance. The analysis of each variable impact shows the educational experience assume almost all variance explained. Previous work experience is near a significant contribution ($p = .06$) and academic achievement did not show significant impact. These data are quite different of lecturers´ perceptions, where work experience assumes the main effect and educational experience the last place (academic achievement is in middle position). It is interesting to verify that students give high importance to educational experience which do not correspond to lecturers' opinions, while previous work experience and academic achievement assume more relevance for lecturers. Perhaps the lack of significance of work experience from students perspective can be related to the presence in this sample of older and workers students with a full-time job, which can reduce the quality of their educational experience and, particularly when this professional activity is in a field not related to the scientific area of graduation (Yanbarisova, 2015; Irwin et al., 2019; Byrne, 2020; Jackson and Bridgstock, 2020). Another interesting data from the present study is that lecturers and students agree that students most prepared for their future career are engineering students, followed by economics and law students, and finally human and social sciences students.

Recognizing institutions and lectures' role on students´ employability perceptions and preparation to work market transition, it is important to analyze the reasons of the discrepancies between lecturers and students. At same time, teaching and academic experiences must consider those perceptions and competencies diverge in function of the scientific areas of education and innovation plans are required to improve these results.

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