

An Entrepreneurial University Taxonomy Proposal

Leire Markuerkiaga, Nekane Errasti, Juan Ignacio Igartua

Mondragon University

Abstract

The European higher education landscape has experienced dramatic changes in the last decades, indeed, it has changed from only teaching to economic and social development of the regions (Bronstein and Reihlen, 2014; Maassen, 2009; Pinheiro and Stensaker, 2013; Vukasovi et al., 2012). As a result, the Entrepreneurial University has turned into a potential solution to these changes (Clark, 1998).

Due to this fact, this paper proposes a taxonomy of Entrepreneurial Universities exploring the nature of the Entrepreneurial University's results. Based on a cluster analysis, three distinct groups are identified, which are in different phases within the transformation into an Entrepreneurial University: (i) the first group of universities (Cluster 2) is in the first phase of the path, since they are not obtaining high Entrepreneurial University's results yet; (ii) the second group (Cluster 3) is in the second phase of the path, obtaining good results in hard entrepreneurial university results; and finally, (iii) the third group (Cluster 1) is composed by the most Entrepreneurial Universities.

In addition, universities are not motionless within a specific group, they can improve and move from one stage to the upper one or not continue that path and move down again to a lower stage. In fact, this paper shows with are the levers in order to move from one stage to the other.

Keywords: Entrepreneurial University, Taxonomy, Academic Entrepreneurship Activities, Cluster Analysis, Entrepreneurial University Results, Academic Entrepreneurship, Higher Education, Internal Entrepreneurship Support Factors, External Entrepreneurship Support Factors

INTRODUCTION

Over the past two decades, the European higher education landscape has been facing a period of profound changes in order to face social global challenges which extend well beyond the economy, innovation and entrepreneurship (Bronstein and Reihlen, 2014; Maassen, 2009; Pinheiro and Stensaker, 2013; Vukasovi et al.,

2012). To overcome the challenges, universities need to meet the needs of its environment and contribute to regional and national economic development (Peterka, 2011); transforming into an Entrepreneurial University (Bronstein and Reihlen, 2014; Clark, 1998; Kirby, 2006; Sporn, 2001).

The emergence of the Entrepreneurial University is the result of internal development of the university and external influences on the university (Peterka, 2011), due to differences in organisational culture and leadership capacity, the process of building entrepreneurial capacity differs from one university to the other (Peterka, 2011). Hence, not all Entrepreneurial Universities are equal, neither they are in the same stage within the path towards the Entrepreneurial University.

There is compelling evidence for seeking a valid and empirically justified means for classifying Entrepreneurial University stages (Moroz et al., 2011). Globally, it is well observed that some universities are better at commercialising research, facilitating entrepreneurial interactions with firms and/or spinning off new ventures than others (Segal, 1986, Di Gregario & Shane, 2003, Etzkowitz, 2002). Classifications of the Entrepreneurial University have been sorted by Armbruster (2008) into several conceptual variations that include “self-regulative universities” (Hölttä, 1995), “adaptive universities” (Sporn, 2001), “enterprise universities” (Hay et al., 2002; Marginson and Considine, 2000), and vague references to “innovative or discovery universities” (Garnsey and Heffernan, 2005; Jian, 2005). In addition, Tijssen (2006) identified three phases for university’s transformation into an Entrepreneurial University; in the first phase, the university becomes more aware of the potential for commercialisation, the second phase is characterised by identifying opportunities for commercialisation, and the third phase by developing commercialisation opportunities.

Nevertheless, there is little research on classifying the Entrepreneurial University, specifically from a performance based perspective (Moroz et al., 2011); reflecting an urgent need to develop an empirically justified Entrepreneurial University taxonomy. Indeed, universities are dynamic entities; they can improve and move from one stage to the upper one or not continue that path and move down again to a lower stage. A taxonomy would help universities to identify the main levers in order to move from one stage to the other. Therefore, the main objective of this paper is to create a taxonomy of Entrepreneurial Universities based on “soft entrepreneurial university results” (onwards Soft EUR) and “hard entrepreneurial university results” (onwards Hard EUR) as Entrepreneurial University’s results (Philpott et al., 2011). We propose to give special attention to the complementarity of the external environmental and the internal organisational entrepreneurship supporting factors (Markuerkiaga et al., 2014).

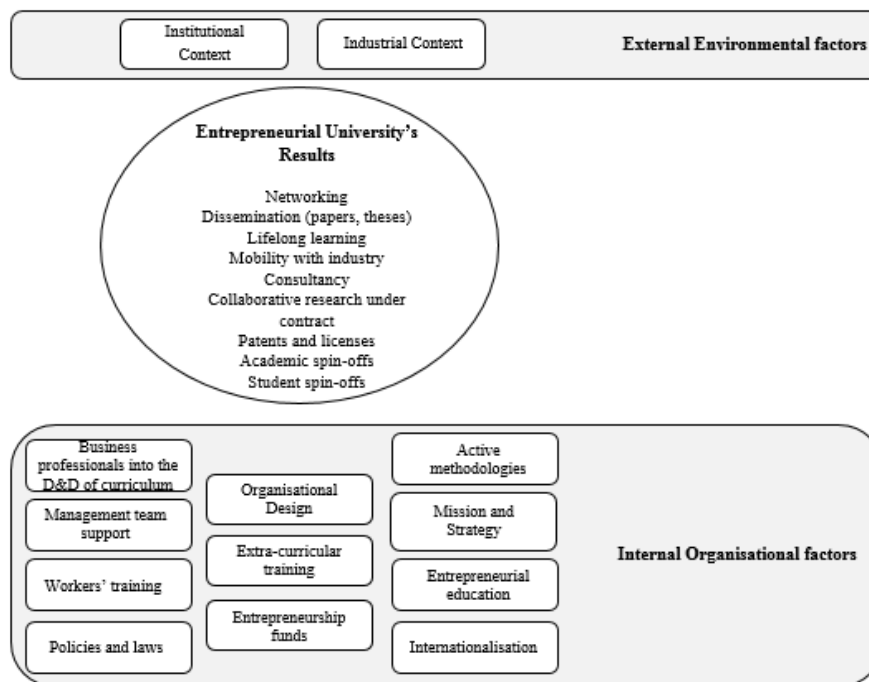
The paper is organized as follows: in section 2 an integrative conceptual framework is built through a review of the literature on the factors fostering the Entrepreneurial University, distinguishing between external and internal entrepreneurship support factors. In section 3 the research design is introduced. Section 4 presents the empirical analysis and through section 5 the results are discussed.

ENTREPRENEURIAL UNIVERSITY FRAMEWORK

The entrepreneurial university has now been discussed for the last two decades (Etzkowitz et al., 2000; Tuunainen, 2005). The entrepreneurial university is defined as having a tendency towards managerial models, and focusing its academic objectives on the transfer of knowledge to the business sector and organisations in general (Spila et al., 2011). This type of university emphasised on the third mission which aims to ensure that the university is actively engaged with the business sector and other organisations in its environment to enhance the value of the knowledge generated by university research, both socially and economically (Etzkowitz, 2003).

Although there is no consensus on a single definition of what the entrepreneurial university is (Guerrero and Urbano, 2010), several authors have argued that this kind of university encompasses a number of general characteristics (Gibb, 2012). These characteristics essentially become factors that contribute to the emergence of the entrepreneurial university (Guerrero et al., 2011; Rothaermel et al., 2007). Figure 1 shows the different factors that are measured and analysed.

Figure 1: Entrepreneurial University Framework



In the following lines the different factors that are measured and analysed in this study are explained in more detail:

Institutional context: Local supportive mechanisms seem to be essential in moving towards becoming an entrepreneurial university (Rasmussen et al., 2012). Governments can facilitate the dissemination of knowledge through their laws and regulations, thus enabling universities to transfer knowledge and intellectual property quickly to the wider community (Wood, 2011). Government also provides financial incentives, both for entrepreneurship education (Guenther and Wagner, 2008), and for the creation of university spin-offs (Fini et al., 2009). Governments can therefore play a vital role in the creation of financing mechanisms for the development of programmes, activities and initiatives related to entrepreneurship education and spin-off creation (Volkman et al., 2009). The institutional context analyses the extent to which government and public administrations become involved in and facilitate entrepreneurship, approving legislation that promotes the dissemination and transfer of knowledge and creating financing mechanisms for entrepreneurship education, the creation of university spin-offs and the development of programmes, activities and initiatives related to entrepreneurship.

Industrial context: The composition of the industry and service of a particular territory can be an important determinant in business and innovation opportunities. The closer interaction between the university and businesses and organisations in the area could help create a social environment that supports and encourages people to share knowledge and ideas (Fini et al., 2009). This factor, therefore, describes to what extent nearby organisations and companies that operate in the same or a similar business sector, interacting with the university by sharing the same field of research, knowledge and ideas through formal and informal networks.

Funds for entrepreneurship: Financial resources are also fundamental within an entrepreneurial university, as this factor demonstrates the autonomy of the university (Guerrero and Urbano, 2010). Hu (2009) showed in her research that both public and private funding sources are important to support the development of an entrepreneurial university. Within this factor, it is essential to distinguish between the funds for research and teaching in entrepreneurship, and the funds for creating entrepreneurship projects and setting up companies and organisations.

Training in entrepreneurship for faculty staff: Despite the interest in entrepreneurship education, there is still a lack of critical mass of lecturers in entrepreneurship, and the current number of entrepreneurship lecturers needs to grow (Volkman et al., 2009). According to Moroz et al. (2010), academics from fields such as business management are selected to coordinate and work on entrepreneurship education, rather than selecting individuals who have been specifically trained in this area or academics who have conducted researched or practised in it. This factor analyses the extent to which the university provides training in entrepreneurship to its staff, in terms of knowledge transfer and spin-offs creation so that they can promote entrepreneurship among their students.

Including professionals from businesses and organisations into the development and delivery of the curriculum: The presence of experts from the business world in the development and delivery of the curriculum facilitates a continuous university-business collaboration process. This includes the use of guest lecturers and representatives of private and public organisations within bachelor, postgraduate and doctoral programmes (Davey et al., 2011). According to De Luca et al. (2014) organisations are in a position to contribute to the university curriculum, providing advice on the current needs and practices of businesses and organisations, and in helping students develop appropriate skills.

Mission and strategy: Some research has emphasised the importance of strategic decision-making in entrepreneurship at the organisational level (Zahra, 1993). Clark (1998) stated that one of the key elements of an entrepreneurial university is to have a clearly defined strategy. According to various authors, this means that any university mission statement and strategies should include the word 'Company/Organisation' or 'Entrepreneurship' (Etzkowitz, 2004; Gibb, 2012; Kirby, 2006). In this way, by publicising the concepts of 'company/organisation' and 'entrepreneurship', these would be accepted as part of the 'meaning' of the university and each member of staff would share a common vision for the creation of an entrepreneurial university (Peterka, 2011). Therefore, taking into account strategic entrepreneurial decision-making at the organisational level, this factor analyses whether the mission statement and strategies of the university include the word 'Company / Organisation' or 'Entrepreneurship' in any of its documents (mission, vision values, strategic plan).

University Policies: The literature on academic entrepreneurship evaluates the influence of university policies, procedures and practices in Academic Entrepreneurship Activities (O'Shea et al., 2005). According to Rothaermel et al. (2007), university policies on intellectual property, networking activities and resource provision are key factors in the success of university spin-offs. Di Gregorio and Shane (2003) agreed that universities that adopt certain policies (such as incentives) generate more academic spin-offs. This factor evaluates the existence and possible influence of university policies, procedures and practices on Academic Entrepreneurship Activities.

Support from the management team: The behaviours and actions within the university reflect the traits of the management team members, since they influence the strategy of the university through decision-making processes (Gibb, 2012; Miller and Katz, 2004; Visintin and Pittino, 2010). According to Todorovic et al. (2005) the nature and strength of leadership in supporting entrepreneurial culture in the university are essential. Therefore, management team support to the entrepreneurial culture is necessary for an entrepreneurial university (Gibb, 2012). This factor analyses the leadership, understanding and support of the management team regarding the entrepreneurial culture in the university, as shown in decision making, behaviours and actions that influence the university's strategy.

Organisational structure: The organisational structure of the university should be designed to promote and facilitate entrepreneurial behaviour (Gibb and Hannon, 2005). Gibb (2012) identified some key factors related to the organisational design of a university that foment entrepreneurial behaviour within it, such as decentralised decision making, flexibility in the integration of strategies and the degree to which individuals have the power to innovate, among other actions. This factor analyses the extent to which a university facilitates entrepreneurial behaviour within it through its own organisational structure.

Formal education in entrepreneurship: Entrepreneurship education can be defined as the development of competences (behaviours, knowledge, skills and attitudes) specific to the individual, which may have different expressions throughout one's professional career and in the generation of long-term benefits for society and the economy (Bratianu and Stanciu, 2010). Experts have indicated that entrepreneurship is a competence that can be acquired or learned (Kuratko, 2005; van der Heide and van der Sijde, 2008) and therefore needs to be integrated into all educational levels (Gibb, 2006). Moreover, entrepreneurship education is essential in order to foster the competencies, skills and knowledge that are fundamental to the development of an entrepreneurial culture (European Commission, 2012). In this way, formal education in entrepreneurship can be defined as the development of competences (behaviours, knowledge, skills and attitudes) specific to the person within academic curricula and in research.

Extra-curricular training for academic entrepreneurship: Academic entrepreneurship does not involve a single event, but rather a continuous process composed of a series of events (Friedman and Silberman, 2003). A deeper understanding of academic entrepreneurship can therefore be achieved through a multi-step process that identifies the actors, activities and key success factors associated with each stage of the process (Salamzadeh et al., 2011; Wood, 2011). That is why the entrepreneurial university must work on each of the stages of the academic entrepreneurship process. Specifically, the extra-curricular training process for academic entrepreneurship refers to the training activities carried out outside the curriculum, such as awareness-raising, workshops for the identification of opportunities and courses for the implementation of innovative projects, the development of business plans and the launch of spin-offs.

Active learning methodologies: Today, any education system should prepare students to work in a rapidly changing, dynamic, entrepreneurial and global environment (Volkman et al., 2009) by fostering the skills, attributes and behaviours that students need to improve both creative and critical thinking (Guerrero and Urbano, 2010). This new scenario requires a paradigm shift for the academic world that should incorporate new teaching-learning methodologies (Moroz et al., 2010). En-

entrepreneurship education professionals should be able to create an open environment in which students develop the confidence to take risks and learn from their successes and failures (Volkman et al., 2009). Project-Based Learning, Problem-Based Learning, case studies, gamification, Service Learning, participation in real projects and work placements in companies or organisations are all active methodologies that can foster the development of entrepreneurship reference.

Internationalisation: There are many synergies between internationalisation and the entrepreneurial university (Larionova, 2012). In fact, the entrepreneurial university considers internationalisation to be a key tool (Gibb, 2012). It is essential to recognise the value of the international mobility of students, academics and business partners in the development and improvement of the entrepreneurial university (Bramwell et al., 2012; Gibb, 2012). It is noteworthy that the internationalisation process can also provide new rewards in terms of revenue, reputation, research opportunities, new partnerships and a greater cultural understanding (Gibb, 2012). The development of joint degrees with universities abroad, the carrying out of international research projects and the mobility activities of students, academics and / or partners are key elements of the entrepreneurial university.

METHODOLOGY

Unit of analysis

Relating to Entrepreneurial Universities literature and the usual units of analysis, Brennan and McGowan (2006) identified the following five levels of analysis:

- Individual: an academic recognised by the university as an entrepreneur.
- Community of practice: an informal social network.
- The academic school: the most basic unit of academic staff for the purpose of university administration.
- University: a grouping of academic schools coordinated through a central faculty structure.
- The entrepreneurship system: the individual and corporate actors who interact in a recognisable context to form the infrastructure for entrepreneurship.

Due to this classification and in order to achieve the main objective of the research, the unit of analyses is the university and the TTO Director the person to interact. the research is based on European universities.

Research instrument

A questionnaire was constructed to collect data directly from universities undertaking the Entrepreneurial University path.

In order to encourage people to read and answer the questionnaire, the layout of the questionnaire was taken into consideration. It was configured a set of questions about the variables to be measured, grouped into related blocks, considering the easiest way for the respondent for concept association. Besides, this questionnaire consisted of closed questions, dichotomous (true/false) and polytomous (a five-point Likert scale, with five being the most important and one the less important rating); and was taken into account the profile of the person who should answer it, in this case the TTO Directors.

The questionnaire was translated. In international research, translation is extremely important, especially if the questions are to have the identical meaning to all participants (Saunders et al., 2011). Back translation is the most commonly used method in multi-country research. Indeed, this technique was applied through the present research; developing the first version of the questionnaire in English, then translating it into Spanish and finally, translating it again into English.

The next step was the pre-testing, the administration of the questionnaire to a small but representative sample of potential respondents under conditions that were identical in all respects to those under which the final questionnaire was administered (Chapman and Singh, 2011). This pre-testing was done by getting the initial response and a subsequent interview with 6 experts from different positions and profiles, such as deans, TTO Directors, academic coordinators and entrepreneurship teachers, in order to identify areas where the questionnaire could needed corrections (Fatoki and Asah, 2011). In consequence, various suggestions were incorporated to make the final questionnaire for the study.

Sampling design, selection and size

This study is concerned with the precision of the element selection and therefore adopts the probability sampling as its representation basis. Probability sampling is based on the concept of random selection thereby affording the sample a random and equal chance of being selected (Saunders et al., 2011). The reason for doing so is because probability sampling methods require the use of sampling frames and statistical analysis which can be done to estimate population parameters from sample statistics. They also allow for tests of significance to be done on the results.

The sample frame is drawn from the total number of European universities (Limpanitgul and Robson, 2009). The sampling is composed by European universities that are promoting entrepreneurship within their institutions and therefore, due to the novelty of this subject, they are participating in international conferences in order to disseminate their learning and best practices. The universities and their respective respondents are selected due to their participation in international conferences related to Entrepreneurial Universities and Entrepreneurial Education (such

as FINPIN Conference, UIIN Conference, BCERC Conference, ECSB Entrepreneurship Education Conference and Global Entrepreneurship Monitor - GEM). In total, 361 European universities were contacted.

Data collection procedure

The present research used a self-administered e-mail questionnaire to collect data for the survey from TTO Directors of the targeted universities. E-mail surveys are a practical, cost-free and suitable data collection method as this study involves a probable wide geographical dispersion of respondents. Online data collection methods have become increasingly attractive to researchers (Asaad, 2011), thanks to its several advantages: (i) unrestricted compass: wide geographical coverage, (ii) low cost of sending out e-mails and faster responses, (iii) higher response rates over postal surveys and (iv) convenience for the respondent.

The process of collecting questionnaires online lasted five months, with a monthly reminder during the first three months. Out of the 361 surveys mailed sixty-nine were returned (19,11%).

Measures and descriptive statistics

After data collection, the data analysing and interpreting stage started (Robson, 1993). For the correct development of the research, a quantitative research methodology is established. Thus, in the present section the data analysis techniques used are explained.

Prior to assessing the measurement scales, validity and reliability of the instrument are explored by incorporating an exploratory factors analysis in order to improve the validity and reliability (Cronbach's alpha) (Parsian, 2009). The analysis shows that the validity and reliability of the instrument is accepted. Besides, Skewness and Kurtosis are tested for normal data distribution. All the values of Kurtosis and Skewness statistics are within the conventional range of $\pm 1,96$ (Ghasemi and Zahediasl, 2012); thus, all manifest variables are reasonably normally distributed. Then, descriptive statistics are conducted with the assistance of SPSS Version 20.0. In order to reveal the central tendency and dispersions of the variables, the mean and the standard deviation are initially calculated.

Regarding the variables that composed the research, every variable of the study is constructed based on a 5-point Likert scale. In addition, Table 1 shows the external and internal entrepreneurship support factors and the Entrepreneurial Universities results.

Table 1: Descriptive statistics of all sample universities

	<i>N</i>	<i>Mini- mum</i>	<i>Maxi- mum</i>	<i>Mean</i>	<i>Std. Devi- ation</i>
INST_CONTEXT	69	1,50	4,80	3,1072	,73491
INDUS_CONTEXT	69	1,40	4,80	3,0797	,78151
STRATEGY	69	1,30	5,00	3,3826	,88649
MANAG_SUPPORT	69	1,00	5,00	3,1883	,79326
ORGANI_DESIGN	69	1,00	4,75	3,0430	,75977
POLICIES	69	1,00	5,00	3,4616	,96867
INDUS_CURRI	69	1,40	4,80	2,9968	,75443
E_CURRI_ACTIVITIES	69	1,00	5,00	3,3387	,92678
INTERNATIONALISATION	69	1,25	5,00	3,2843	,83722
E_FUNDS	69	1,00	5,00	2,4254	,89540
E_EDUCATION	69	1,00	5,00	3,0149	,90754
E_STAFF	69	1,00	5,00	2,4248	1,00179
METHODS	69	1,00	5,00	3,0361	,82034
INFO_DISSEMINATION	69	1,00	4,33	2,8761	,62047
NETWORKING	69	1,33	4,33	3,2532	,62159
I_TRAINING	69	1,00	5,00	3,0435	,86492
IND_MOBILITY	69	1,00	4,33	2,5343	,62410
CONSULTING	69	1,00	5,00	3,2319	,80704
PR_RESEARCH	69	1,67	5,00	3,0530	,72748
PATENT_LICENSE	69	1,00	4,00	2,5707	,59232
ASO	69	1,40	4,20	2,5478	,56532
SSO	69	1,25	4,25	2,7283	,61198

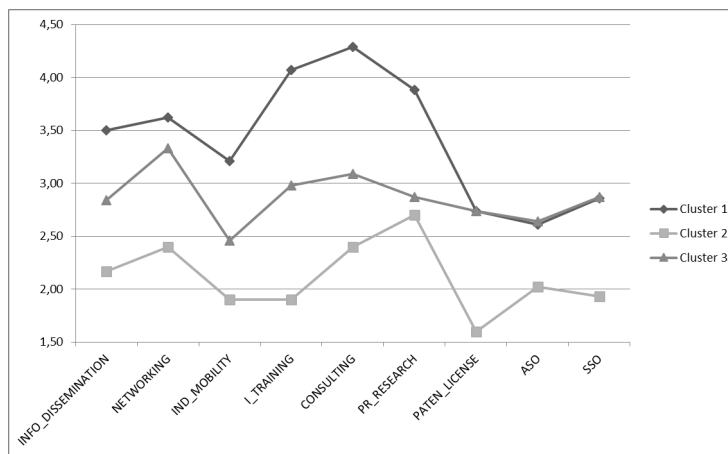
Cluster analysis

Cluster analysis is used to explore the patterns of European Entrepreneurial Universities, based on both soft and hard entrepreneurial university results; since results

show if the university is achieving its third mission or not . Information dissemination, networking, industry mobility, consulting, contract research, patent and license, and spin-off firm formation were the clustering variables.

As a result, the universities are clustered, regarding Entrepreneurial University's results, into three different groups: Cluster 1 composed by fourteen universities (high values in Soft EUR and on the mean in Hard EUR), Cluster 2 composed by ten universities (low values in all Entrepreneurial University's results) and Cluster 3 composed by forty-five universities (on the mean in all Entrepreneurial University's results) (see Figure 2).

Figure 2: Entrepreneurial University's results of the three clusters



Afterwards, an ANOVA analysis was developed in order to confirm the difference between the three clusters regarding Entrepreneurial University's results. Thus, through a comparison of means (see Table 2) the rejection of the null hypothesis of equal means is shown.

Table 2: ANOVA analysis of Entrepreneurial University's results for the three clusters

		<i>Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>Sig.</i>
INFO_DISSEMINATION	Between Groups	10,525	2	5,262	22,187	,000
	Within Groups	15,654	66	,237		
	Total	26,178	68			
NETWORKING	Between Groups	9,421	2	4,710	18,447	,000
	Within Groups	16,853	66	,255		

	Total	26,273	68			
I_TRAINING	Between Groups	28,063	2	14,032	40,607	,000
	Within Groups	22,806	66	,346		
	Total	50,870	68			
IND_MOBILITY	Between Groups	10,691	2	5,345	22,335	,000
	Within Groups	15,795	66	,239		
	Total	26,486	68			
CONSULTING	Between Groups	23,388	2	11,694	36,926	,000
	Within Groups	20,902	66	,317		
	Total	44,290	68			
PR_RESEARCH	Between Groups	12,263	2	6,131	17,057	,000
	Within Groups	23,725	66	,359		
	Total	35,987	68			
PATENT_LICENCE	Between Groups	11,066	2	5,533	28,547	,000
	Within Groups	12,792	66	,194		
	Total	23,857	68			
ASO	Between Groups	3,268	2	1,634	5,841	,005
	Within Groups	18,464	66	,280		
	Total	21,732	68			
SSO	Between Groups	7,547	2	3,773	13,897	,000
	Within Groups	17,921	66	,272		
	Total	25,467	68			

Once the differences between groups' means are demonstrated, the means of each cluster of the Entrepreneurial University's results are analysed. Cluster 2 obtains the less significant values on all Entrepreneurial University's results, except for PR_RESEARCH, variable that is in the same level of Cluster 3. Regarding Cluster 1, these are the universities that obtain the highest values on Soft EUR and are in the same level of Cluster 3 regarding Hard EUR. Finally, Cluster 3 is on the mean on all Entrepreneurial University's results.

Based on these three clusters it was interesting to analyse their differences regarding external and internal entrepreneurship support factors in order to identify the main mechanisms that leading universities had for Entrepreneurial University's

results promotion. To achieve this objective, an ANOVA was performed for both groups (see Table 3 and Table 4); which shown all p-values under the threshold 0,005, falling to reject the null hypothesis.

Table 3: ANOVA analysis of external entrepreneurship support factors for the three clusters

		Sum of Squares	df	Mean Square	F	Sig.
INDUS_CONT EXT	Between Groups	9,388	2	4,694	11,332	,000
	Within Groups	27,338	66	,414		
	Total	36,726	68			
INST_CONTE XT	Between Groups	7,565	2	3,783	7,350	,001
	Within Groups	33,966	66	,515		
	Total	41,532	68			

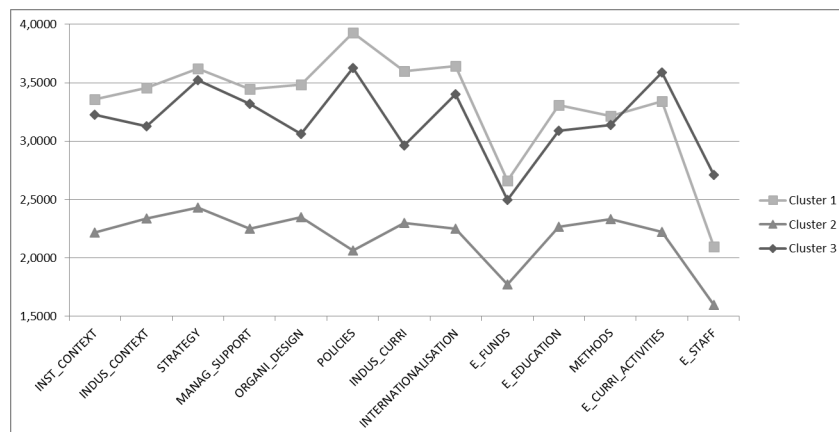
Table 4: ANOVA analysis of internal entrepreneurship support factors for the three clusters

		Sum of Squares	df	Mean Square	F	Sig.
STRATEGY	Between Groups	10,723	2	5,361	8,284	,001
	Within Groups	42,717	66	,647		
	Total	53,439	68			
MANAG_SUP PORT	Between Groups	10,497	2	5,249	10,727	,000
	Within Groups	32,292	66	,489		
	Total	42,790	68			
ORGANI_DES IGN	Between Groups	7,530	2	3,765	7,834	,001
	Within Groups	31,722	66	,481		
	Total	39,253	68			
POLICIES	Between Groups	23,753	2	11,876	19,570	,000
	Within Groups	40,053	66	,607		
	Total	63,806	68			
INDUS_CURR I	Between Groups	9,998	2	4,999	11,493	,000
	Within Groups	28,706	66	,435		
	Total	38,704	68			
INTERNATIO NAL.	Between Groups	13,128	2	6,564	12,545	,000
	Within Groups	34,535	66	,523		
	Total	47,663	68			
E_FUNDS	Between Groups	5,213	2	2,607	3,489	,036
	Within Groups	49,305	66	,747		

	Total	54,518	68			
E_EDUCATION	Between Groups	7,058	2	3,529	4,758	,012
	Within Groups	48,950	66	,742		
	Total	56,007	68			
METHODS	Between Groups	5,848	2	2,924	4,835	,011
	Within Groups	39,913	66	,605		
	Total	45,761	68			
E_CURRI_ACTIVITIES	Between Groups	15,155	2	7,578	11,563	,000
	Within Groups	43,251	66	,655		
	Total	58,407	68			
E_STAFF	Between Groups	12,013	2	6,007	7,050	,002
	Within Groups	56,230	66	,852		
	Total	68,243	68			

Once the differences between groups' means were demonstrated, the means of the external and internal entrepreneurship support factors for each cluster were analysed (see Figure 3). As it is shown in the figure below, Cluster 2 obtained the less significant values on all external and internal entrepreneurship support factors which agreed with the results on Entrepreneurial University's results, considering that this group of universities had the lower values on Entrepreneurial University's results. Regarding Cluster 1, the best universities as to Soft EUR, obtained the highest results on all external entrepreneurship support factors and the highest results on almost all internal entrepreneurship support factors, except for E_CURRI_ACTIVITIES & E_STAFF. Finally, Cluster 3 showed better results on E_CURRI_ACTIVITIES & E_STAFF than Cluster 1 although their results on Soft EUR were worst.

Figure 3: Entrepreneurship support mechanisms level of the three clusters



RESULTS

In order to develop a universities' taxonomy depending on Entrepreneurial University's results, shows three different groups: Cluster 1 composed by fourteen universities, Cluster 2 composed by ten universities and Cluster 3 composed by forty-five universities. Afterwards, an ANOVA analysis was developed in order to confirm the difference between the three clusters regarding the Entrepreneurial University's results and both external and internal entrepreneurship support factors. In the following lines there are further details regarding the three clusters.

Cluster 1

The fourteen Universities in Cluster 1 are the ones which stand out for their exceptional results on Lifelong Learning, Consultancy and Collaborative Research. These three results suggest a higher university business collaboration, since the three are directly related to knowledge transfer between the two organisations. This fact could be due to the high support they have from industry (i.e. high values on Industrial Context). Besides, regarding internal organisational factors, the universities from this first cluster also obtain high values as to their organisational design, since they have a contemporary organisational design which promotes the decentralisation of decision making and empowered their employees to innovate (through a bottom-up flow). This fact could also reinforce the promotion of Lifelong Learning, Consultancy and Collaborative Research, seeing that the decentralisation of decision making push academic and researcher into knowledge transfer activities. Although universities from this cluster also obtained good results in Dissemination, Networking and Mobility with Industry, they are similar to Cluster 3. Regarding Patents and Licenses, Academic spin-offs and Student spin-offs (or Hard EUR), these universities are in the same level as Cluster 3. Moving on to the entrepreneurship support mechanisms, these universities obtained high values on almost all entrepreneurship support mechanisms except on Extra-curricular training and Workers' Training. This fact reiterates previous results, ratifying that the support of Extra-curricular training and Workers' Training is unnecessary for improving on Soft Entrepreneurial University's results if there is a supportive industrial context (Industrial Context).

Cluster 2

Universities from Cluster 2 (composed by ten universities) are the ones that obtained the worst values on all Entrepreneurial University's results, except for Collaborative Research, result that was in the same level of Cluster 3. Furthermore, these universities have neither a supportive external environment nor a supportive internal organisation; since all the values obtained within these factors are really

low. These facts could be because these universities are still at the beginning of the Entrepreneurial Universities' path.

Cluster 3

Universities from Cluster 3 (composed by forty-five universities) are the ones that obtain average scores on almost all Entrepreneurial University's results, except on Patents and Licenses, Academic spin-offs and Student spin-offs; which are on the same level as Cluster 1. Thus, universities from this cluster are good on Hard EUR development. Furthermore, it should be highlighted that this group of universities obtained the lowest values on Collaborative Research; fact that could be related to the high level of Hard EUR, since fostering direct mechanisms of knowledge transfer could reduce Collaborative Research. Besides, another reason for the low values on Collaborative Research could be the low Industrial Context that this group of universities have. In this vein, another characteristic of these universities is the low presence of Professionals from businesses into the development and delivery of the curriculum, which could be also due to the low Industrial Context. Regarding the internal entrepreneurship support factors, Extra-curricular training and Workers' training stand out because of their high values; which could be directly related with the good values on Hard EUR.

DISCUSSION

From this taxonomy, it is clearly showed that these universities are in different stages within the path of the Entrepreneurial University. There is a first stage (Cluster 2) where universities are not inside a supportive external environment and internally they are still backward regarding the internal entrepreneurship support factors. Therefore, they are not obtaining high Entrepreneurial University's results yet. In the second stage (Cluster 3), universities start promoting entrepreneurship (through Extra-curricular training and Workers' training) within its collective and although they do not have a really supportive Industrial Context, they are obtaining good results in Hard EUR. And finally, the third stage (Cluster 1) is composed by the most Entrepreneurial Universities, which thanks to a supportive Industrial Context obtain really good values on Soft EUR; maintaining the same level as the second stage on Hard EUR. Besides, this cluster promotes less Extra-curricular training and Workers' training and obtains the same results on Hard EUR as Cluster 2, reinforcing the importance that a supportive industrial context has.

The cluster analysis showed that not all universities are in the same level regarding Entrepreneurial University's results. The analysis clearly proved that universities are in different stages within the Entrepreneurial University path; indeed, they could be classified into three stages. Universities from the first stage are not inside a supportive external environment and internally are still backward regarding the

internal entrepreneurship support factors. Therefore, they are not obtaining high Entrepreneurial University's results. Universities from the second stage start promoting entrepreneurship and obtaining good results on Hard EUR through two main activities: on the one hand, providing support within the whole entrepreneurship process and on the other hand, training its staff on entrepreneurship. Besides, these universities do not have a really supportive industrial context. Universities from the third stage, thanks to a supportive industrial context obtain really good values on Soft EUR; maintaining the same level as the second stage on Hard EUR. Moreover, these universities promote less internal entrepreneurship support factors, concretely the support within the whole entrepreneurship process and the training in entrepreneurship for its staff. In fact, the core factor for staying in this stage is to have a supportive industrial context.

Universities are not motionless within a specific stage; they can improve and move from one stage to the upper one or not continue that path and move down again to a lower stage. In fact, an Entrepreneurial University has to work on specific factors depending on its objective. If the university wants to improve on Hard EUR it has to provide support within the whole entrepreneurship process and promote its internationalisation activity, and do not care about industries' presence on curriculum development and delivery. Therefore, with respect to the promotion of these two internal entrepreneurship support factors, universities should implement different activities.

Regarding university's support within the whole entrepreneurship process, academic entrepreneurship is not a single event, it is a multi-stage process model that identifies the key actors, activities, potential stakeholders and key success drivers associated with each stage of the innovation commercialisation process (Salamzadeh et al., 2011; Wood, 2011). Therefore, the university should provide supportive activities within each phase of the entrepreneurship process; such as: talks with entrepreneurs in order to make aware of the entrepreneurship importance, innovation and creativity workshops in order to generate new possible business ideas, business model and business plan courses in order to become this business ideas into business project and finally, courses on new business venture launching.

Internationalisation is a key tool for an Entrepreneurial University, since mobility (beyond the local level to the international plane) of students, academics and industrial collaborators in developing and enhancing Entrepreneurial Universities is essential (Bramwell et al., 2012; Gibb, 2012). Therefore universities have to increase their international activities and collaborations.

On the contrary, if university's objective is to increase Soft EUR, it has to work on promoting industries' presence on curriculum development and delivery and developing policies and laws regarding entrepreneurial issues. Besides, they do not have to make any effort on training its staff in entrepreneurship. In this vein, so as to boost these two entrepreneurship support mechanisms universities should work on different activities.

The industry presence in curriculum development and delivery is the process of creating a learning environment and the development of human resources relevant

to modern society. In fact, universities have to include the following mechanisms: university business collaboration in the development of a fixed programme of courses, modules, planned experiences as well as guest lectures by delegates from private and public organisations within undergraduate, graduate, PhD programmes or through further professional education (Davey et al., 2011).

Regarding policies on both university-business cooperation (onwards UBC) and entrepreneurship (between the university and the researcher/ worker/ student), universities should develop some policies in order to establish a working framework. On the one hand, regarding UBC policies, universities should clarify students' internships, knowledge transfer activities and the promotion of R&D, among other activities. And on the other hand, regarding entrepreneurship universities should establish the distribution of royalty rates between inventors and the university, since it could influence the propensity of entrepreneurs to found firms to exploit university inventions, the university's choice to take an equity stake in the spin-off firm in exchange for paying patenting, marketing, or other up-front costs and the use of internal venture capital funds has to be regulated.

CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH

As the cluster analysis showed, not all universities are in the same stage regarding Entrepreneurial University's results. The analysis clearly showed that universities are in different stages within the Entrepreneurial University path; indeed, they could be classified into three stages.

In addition, universities are not motionless within a specific stage; they can improve and move from one stage to the upper one or not continue that path and move down again to a lower stage; and the performance-based taxonomy of Entrepreneurial Universities showed within this paper would help universities to identify the main levers in order to move from one stage to the other.

However, the study also presents some limitations. Firstly, the sample size used, which do not allow a more rigorous statistical analysis. Indeed, sixty-nine European universities answered the whole questionnaire out of the 361 surveys mailed. Likewise, the results' generalizability is unreal; since, although normality was achieved for all variables, the sample was not significant enough to extrapolate the results to the whole population. This makes that the findings of the previous section were applicable only to the sample tested. Secondly, another limitation dealt with the measures used in the research; since data was gathered throughout scales getting TTO Directors' self-perceptions on her/his university, and therefore these variables have a degree of subjectivity.

An interesting extension of the paper would be the analysis of more European universities, in order to increase the size and the homogeneity of the sample; since there are specific cultural, political determinants that may affect the results. To get a global vision of the Entrepreneurial University, it could be interesting to survey

different people within the university. Indeed, they could be classified into two groups: on the one hand, the management team, the TTO Director, etc. and on the other hand, the researchers, professors, etc. This large number of questionnaires could allow developing more complex models that include latent (unobserved) variables, formative variables, chains of effects (mediation), and multiple group comparisons (e.g. multilevel analysis) of these more complex relationships.

REFERENCES

- Armbruster, C. (2008) 'Research Universities: autonomy and self-reliance after the Entrepreneurial University', *Policy Futures in Education*, Vol. 6 No. 4, pp.372-389.
- Bramwell, A., Hepburn, N. and Wolfe, D. A. (2012) *Growing innovation ecosystems: university industry knowledge transfer and Regional Economic Development in Canada*, University of Toronto, Toronto.
- Bratianu, C. and Stanciu, S. (2010) 'An overview of present research related to entrepreneurial university', *Management & Marketing*, Vol. 5 No. 2, pp.117-134.
- Bronstein, J. and Reihlen, M. (2014) 'Entrepreneurial University Archetypes: A Meta-Synthesis of Case Study Literature', *Industry and Higher Education*, Vol. 28 No. 4, pp.245-262.
- Clark, B. R. (1998) *Creating entrepreneurial universities: organizational pathways of transformation*, Pergamon, Kidlington (Oxford).
- Davey, T., Baaken, T., Galan Muros, V. and Meerman, A. (2011) *The state of European university-business cooperation*, European Commission, DG Education and Culture, Brussels.
- De Luca, D., Taylor, R. and Prigmore, M. (2014) 'Rules of engagement: understanding the dynamics of social enterprise and business requirements on academic collaboration' in University industry interaction conference, Barcelona.
- Di Gregorio, D. and Shane, S. (2003) 'Why do some universities generate more start-ups than others?', *Research Policy*, Vol. 32 No. 2, pp.209-227.
- Etzkowitz, H. (2003) 'Research groups as "quasi-firms": the invention of the entrepreneurial university', *Research Policy*, Vol. 32 No. 1, pp.109-121.
- Etzkowitz, H. (2004) 'The evolution of the entrepreneurial university', *International Journal of Technology and Globalisation*, Vol. 1 No. 1, pp.64-77.
- Etzkowitz, H., Webster, A., Gebhardt, C. and Cantisano, B. R. (2000) 'The future of the university and the university of the future: evolution of ivory tower to entrepreneurial paradigm', *Research Policy*, Vol. 29 No. 2, pp.313-330.
- European Commission (2012) 'Effects and impact of entrepreneurship programmes in higher education', Vol. No.
- Fini, R., Grimaldi, R. and Sobrero, M. (2009) 'Factors fostering academics to start up new ventures: an assessment of Italian founders' incentives', *The Journal of Technology Transfer*, Vol. 34 No. 4, pp.380-402.
- Friedman, J. and Silberman, J. (2003) 'University Technology Transfer: Do Incentives, Management, and Location Matter?', *The Journal of Technology Transfer*, Vol. 28 No. 1, pp.17-30.
- Garnsey, E. and Heffernan, P. (2005) 'High-technology clustering through spin-out and attraction: The Cambridge case', *Regional Studies*, Vol. 39 No. 8, pp.1127-1144.
- Ghasemi, A. and Zahediasl, S. (2012) 'Normality tests for statistical analysis: a guide for non-statisticians', *International Journal of Endocrinology and Metabolism*, Vol. 10 No. 2, pp.486.
- Gibb, A. (2006) 'Entrepreneurship/enterprise education in schools and colleges: Are we really building the onion or peeling it away?' in International Council for Small Business ICSB 51st World Conference.

- Gibb, A. (2012) Exploring the synergistic potential in entrepreneurial university development: towards the building of a strategic framework. *Annals of Innovation & Entrepreneurship* [Online]. <http://www.journals.co-action.net/index.php/aie/article/download/16742/pdf> (Accessed 2 September 2014).
- Gibb, A. and Hannon, P. (2005) 'Towards the entrepreneurial university', *International Journal of Entrepreneurship Education*, Vol. 4 No. 1, pp.73-110.
- Guenther, J. and Wagner, K. (2008) 'Getting out of the ivory tower—new perspectives on the entrepreneurial university', *European Journal of International Management*, Vol. 2 No. 4, pp.400-417.
- Guerrero, M., Toledano, N. and Urbano, D. (2011) 'Entrepreneurial universities and support mechanisms: a Spanish case study', *International Journal of Entrepreneurship and Innovation Management*, Vol. 13 No. 2, pp.144-160.
- Guerrero, M. and Urbano, D. (2010) *The creation and development of entrepreneurial universities in Spain: An institutional approach*, Nova Science Publishers, New York.
- Hay, D. B., Butt, F. and Kirby, D. A. (2002) *Academics as Entrepreneurs in a UK University*, Open University Press, Buckingham.
- Hölttä, S. (1995) *Towards the self-regulative university*, Joensuu yliopisto (Joensuu), Finland.
- Hu, M. C. (2009) 'Developing entrepreneurial universities in Taiwan: The effects of research funding sources', *Science, Technology and Society*, Vol. 14 No. 1, pp.35-57.
- Jian, L. (2005) 'Command the Construction of the Innovative University with the Scientific Development Theory', *Modern University Education*, Vol. 4 No. 2.
- Kirby, D. (2006) 'Creating Entrepreneurial Universities in the UK: Applying Entrepreneurship Theory to Practice', *The Journal of Technology Transfer*, Vol. 31 No. 5, pp.599-603.
- Kuratko, D. F. (2005) 'The emergence of entrepreneurship education: Development, trends, and challenges', *Entrepreneurship Theory and Practice*, Vol. 29 No. 5, pp.577-598.
- Larionova, M. (2012) Published. Internationalisation and the Entrepreneurial University: Mutual Reinforcement for Maximum Results. Rethinking education, reshaping economies: A conversation starter for the EAIE 2012 Annual Conference.
- Maassen, P. (2009) 'The modernisation of European higher education', *From governance to identity*, Springer, pp.95-112.
- Marginson, S. and Considine, M. (2000) *The enterprise university: Power, governance and reinvention in Australia*, Cambridge University Press, United Kingdom.
- Markuerkiaga, L., Errasti, N. and Igartua, J. I. (2014) 'Success factors for managing an entrepreneurial university: Developing an integrative framework', *Industry and Higher Education*, Vol. 28 No. 4, pp.233-244.
- Miller, M. and Katz, M. (2004) *Effective shared governance: Academic governance as a win-win proposition*, The NEA Almanac of Higher Education, Washington.
- Moroz, P. W., Hindle, K. and Anderson, R. (2010) 'Collaboration with entrepreneurship education programmes: building spinout capacity at universities', *International Journal of Innovation and Learning*, Vol. 7 No. 3, pp.245-273.
- Moroz, P. W., Hindle, K. and Anderson, R. (2011) 'Formulating the differences between Entrepreneurial Universities: a performance based taxonomic approach' in Annual ICSB World Conference.
- O'shea, R. P., Allen, T. J., Chevalier, A. and Roche, F. (2005) 'Entrepreneurial orientation, technology transfer and spinoff performance of U.S. universities', *Research Policy*, Vol. 34 No. 7, pp.994-1009.
- Parsian, N. (2009) 'Developing and validating a questionnaire to measure spirituality: a psychometric process', *Global journal of health science*, Vol. 1 No. 1, pp.2-11.
- Peterka, S. O. (2011) Published. Entrepreneurial university as the most important leverage in achieving knowledge-based society. In: Zlatan Reić, V. Š., ed. The Ninth International Conference: "Challenges of Europe: Growth and Competitiveness – Reversing the Trends", Split, Croatia.

- Philpott, K., Dooley, L., O'reilly, C. and Lupton, G. (2011) 'The entrepreneurial university: Examining the underlying academic tensions', *Technovation*, Vol. 31 No. 4, pp.161-170.
- Pinheiro, R. and Stensaker, B. (2013) 'Designing the Entrepreneurial University: The Interpretation of a Global Idea', *Public Organization Review*, Vol. 14 No. 4, pp.497-516.
- Rasmussen, E., Bulanova, O., Jensen, A. and Causen, T. (2012) *The impact of science-based entrepreneurial firms - a literature review and policy synthesis*, Nordlands Forskning - Nordland Research Institute, Norway.
- Robson, C. (1993) *Real world research: A resource for social scientists and practitioners-researchers*, Blackwell Publishers Ltd., Oxford.
- Rothaermel, F. T., Agung, S. D. and Jiang, L. (2007) 'University entrepreneurship: a taxonomy of the literature', *Industrial and Corporate Change*, Vol. 16 No. 4, pp.691-791.
- Salamzadeh, A., Salamzadeh, Y. and Daraei, M. (2011) 'Toward a systematic framework for an entrepreneurial university: a study in Iranian context with an IPOO model', *Global Business and Management Research: An International Journal*, Vol. 3 No. 1, pp.31-37.
- Spila, J. C., Barrenechea, J. and Ibarra, A. (2011) 'Entrepreneurial culture, innovation and competences in higher education the Gaze program case', *Cultura emprendedora, innovación y competencias en la educación superior el caso del programa gaze*, Vol. 187 No. EXTRA 3, pp.207-212.
- Sporn, B. (2001) 'Building Adaptive Universities: Emerging Organisational Forms Based on Experiences of European and US Universities', *Tertiary Education and Management*, Vol. 7 No. 2, pp.121-134.
- Tijssen, R. J. W. (2006) 'Universities and industrially relevant science: Towards measurement models and indicators of entrepreneurial orientation', *Research Policy*, Vol. 35 No. 10, pp.1569-1585.
- Todorovic, W. Z., Mcnaughton, R. B. and Guild, P. D. (2005) 'Making university departments more entrepreneurial: the perspective from within', *The International Journal of Entrepreneurship and Innovation*, Vol. 6 No. 2, pp.115-122.
- Tuunainen, J. (2005) 'Hybrid practices? Contributions to the debate on the mutation of science and university', *Higher Education*, Vol. 50 No. 2, pp.275-298.
- Van Der Heide, S. and Van Der Sijde, P. (2008) 'The Entrepreneurial University: the University of Twente's Concept for Innovation', *Higher education institutions and innovation in the knowledge society*, Oy Nord Print Ab, Helsinki: Finland, pp.37-44.
- Visintin, F. and Pittino, D. (2010) 'Successful technology transfer in uncertain contexts: the role of top management team diversity in university spin-off firms' in XI Workshop dei Docenti e dei Ricercatori di Organizzazione Aziendale, Bologna.
- Volkman, C., Wilson, K. E., Marlotti, S., Rabuzzi, D., Vyakarnam, S. and Sepulveda, A. (2009) *Educating the Next Wave of Entrepreneurs: Unlocking entrepreneurial capabilities to meet the global challenges of the 21st Century*, World Economic Forum: A Report of the Global Education Initiative, Switzerland.
- Vukasovi, M., Maassen, P., Nerland, M. and Stensaker, B. (2012) *Effects of Higher Education Reforms: Change Dynamics*, Sense Publishers, Netherlands.
- Wood, M. S. (2011) 'A process model of academic entrepreneurship', *Business Horizons*, Vol. 54 No. 2, pp.153-161.
- Zahra, S. A. (1993) 'A conceptual model of entrepreneurship as firm behavior: A critique and extension', *Entrepreneurship Theory and Practice*, Vol. 17 No. 4, pp.5-21.